

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER
AND ELECTRO-PLATERS REVIEW.



A TRADE JOURNAL

AND ALLOYS.

RELATING TO THE NON-FERROUS METALS

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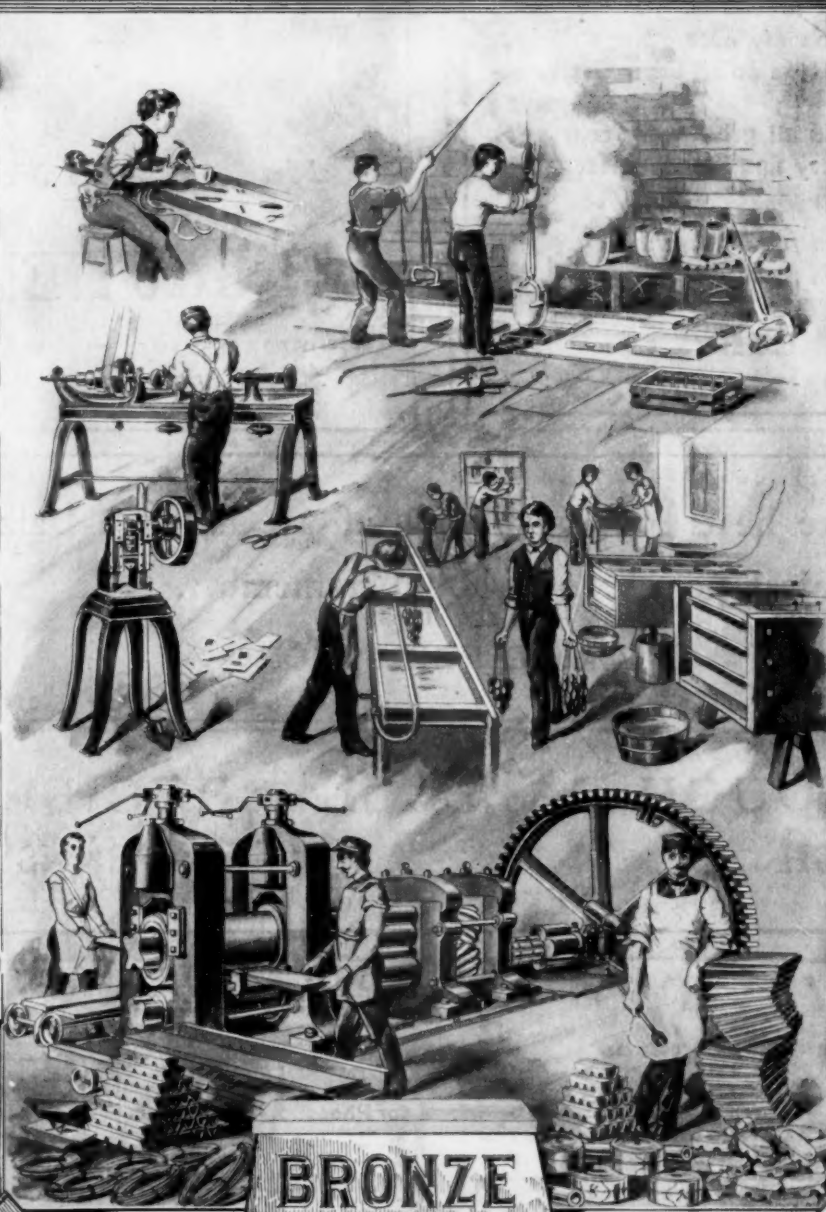
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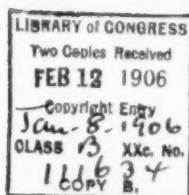
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CONTENTS

	PAGE.
Editorial	27
Recent Tests of Metals.....	29
Alkali Resisting Alloys.....	30
Shearing Tests of Alloys.....	30
Casting Manganese Bronze.....	31
Magnesium Metal in Brass Casting Work.....	32
Manufacture of Cartridge Cases.....	32
Coloring Silver.....	33
Bronze Medal.....	34
Hot Galvanizing Process.....	35
Copper Plating Iron Castings.....	36
Uses of Aluminum.....	37
Aluminum Automobile Castings.....	38
Automobile Shows.....	38
Molds for Complicated Patterns.....	39
Electro-Plating Apparatus.....	39
Correspondence Department.....	42
Patents	45
Trade News.....	47

COST-KEEPING IN THE BRASS FOUNDRY.

Time was, and it is not so very long ago, when in the brass foundry, and especially in the smaller ones which make up the majority of establishments, a systematic method of keeping cost was a thing unheard of and the foreman carried the whole business under his hat. In some establishments with an able and intelligent foreman and a superior class of workmen this way of doing things answered quite well, but where the conditions were not so good it was just the reverse. There seemed to be an impression among brass workers that a brass foundry could not be kept clean and tidy because at least the majority of small brass foundries were in the opposite condition. In such places probably nobody ever had an accurate idea of just how much the various classes of work cost to produce or how much valuable metal scrap was lying around or how much of the metals disappeared by being stolen. Nevertheless it is possible to run a brass foundry on a different plan, as is shown by some conspicuous good examples.

It is, of course, a more or less difficult matter where a number of small articles are made to keep the costs of each kind separate, so that the cost of production of each article can be accurately known. This is the point in which most foundries have not been sufficiently discriminating. The total cost of production is, of course, known, but it is the distribution of this cost on the different articles produced where a great many mistakes have been made and where it was just as likely that the costs have been figured too high or too low. As Mr. J. G. Murdock, Jr., of the American Brass Works of Cincinnati, in a recent talk before the Cleveland meeting of the Brass Manufacturers fitly expresses it: "A cost reached by striking an average among a variety of articles cannot be considered a correct one. Each article should be figured independently of all others and it should not be necessary to sell $\frac{3}{4}$ -inch bibbs in order to help the $\frac{1}{2}$ -inch out of the difficulty, or vice versa. A profit should be made on each article made regardless of anything else that is made in the factory."

This is unquestionably the right way from a business point of view of looking at the matter, but the old method of weighing up the metals used and the fuel used for smelting and figuring out the amount of foundry supplies consumed and adding in the general expenses, dividing the

total by the weight of the castings produced is not the proper way of arriving at such detailed knowledge of the cost of every article. The way to be adopted should be to follow each article or group of articles of the same kind through the various manipulations in the foundry and so distribute the time spent by the various workers in its manufacture that its exact cost can be known definitely. An intelligent foreman can well be relied upon to distribute, for instance, the cost of molding the various articles and even his co-operation will not be required after a while, as the molders will soon learn how to do that themselves. A procedure of this kind will not throw too much work on the foreman, and when it is done each day gives him a general line on all the work done during one day, which is quite valuable in enabling him to lay out the work for the next day. A uniform method of cost keeping is, of course, to be desired, but it may be some time yet before manufacturers can agree upon a standard method of figuring out costs.

THE SCARCITY OF ALUMINUM.

In this era of great demand for the metals commonly used in the trades, aluminum is one which has not escaped the attention of metal consumers. The uses to which this metal is put in various branches of the metal trade have increased quite considerably within recent years. Much of the metal is consumed for castings of various kinds, and evidences to what large extent aluminum castings enter, for instance, into the construction of automobiles, were abundant at the recent automobile shows held in New York. The demand for this metal is shown best by the number of inquiries received by THE METAL INDUSTRY asking for the names of dealers who might have different forms of aluminum in stock. In many of these instances it was stated that the metal could not be obtained from the manufacturers for some months to come.

This condition of affairs exists in spite of the fact that the American manufacturers are increasing the capacity of their plants at Niagara, Messina and Pittsburg and are to build a new rolling mill at Niagara. The manufacturers state also that one of the causes of the scarcity of the metal is that foreign manufacturers have bought up all the aluminum scrap in sight in the United States, thus forcing the consumers to buy new metal. The manufacturers say that they have refused many orders for the metal from abroad, where a scarcity also exists. They did that in order that they might take care of their domestic consumers.

The prices for American aluminum have been the same since 1900 until recently, when they were raised 5 per cent. for both ingot and sheet. It is stated that the foreign prices for the metal for the last year or two have been 10 or 15 cents higher than the American prices. According to U. S. Consul-General Gunther of Frankfurt, the production has been largely increasing in Europe. There are four companies operating at present in Europe, namely, the Aluminum Industry, A. G., in Neuhausen, Switzerland, the British Aluminum Com-

pany, at Foyers, Scotland, the Société électro-métallurgique française at La Praz and Les Sordrettes, France, and the Société des produits chimiques d'Alois et de la Camargne, at Calypse and St. Felix, France. The total annual production of the three works of the first-named company is estimated by the Consul at 3,675 tons, and it is claimed that it paid last year an 18 per cent. dividend on its stock and recently raised its share capital from 16,000,000 to 26,000,000 francs. The new shares were taken by a bankers' syndicate at 250 per cent. The Neuhausen Company also employs 200 workmen at the chemical works in Deutsch Lissa, Silesia, Germany, in making salts of aluminum.

The British Aluminum Company has another works in Sarpsfos, Norway, and the total production of the company is estimated at 2,250 tons per annum. The Société électro-métallurgique française produces about 2,325 tons of aluminum per year and the Société d'Alois is stated to have a yearly production of about 2,100 tons. Consul Gunther states that one of the European manufacturing firms has its entire production of the metal sold up for several years. The American production is estimated at 4,200 tons.

The aluminum producing industry in the United States is in the happy position of possessing virtually a monopoly, protected as it is by exclusive patent rights. Nevertheless, the manufacturers have never disabused their power towards keeping prices unreasonably high but have adopted the farsighted policy of fostering the progress of the industry and encouraging efforts towards introducing the metal in various lines of the metal working industry, where its use has now become firmly established.

The uses of aluminum in Europe are about the same as in America, cooking utensils, pieces for automobiles and military equipments occupying the first place in regard to the quantities of aluminum they consume.

OUR NEW OFFICE.

THE METAL INDUSTRY has taken a new office in the same building where it has been for the past three years—61 Beekman street, New York. We now have larger and pleasanter quarters and shall be pleased at any time to have a call from any of our advertisers or subscribers. Our out-of-town friends are invited to make THE METAL INDUSTRY office their headquarters while on business trips to New York. Telephone service, writing desks and materials will be at their disposal. We are also pleased at any time to have a call from any one interested in the non-ferrous metals.

SEMI-CENTENNIAL OF THE IRON AGE.

The bulky volume of 452 pages which was issued by the *Iron Age* as the first number of this year fitly celebrates the fiftieth anniversary of the existence of a publication which has rendered valuable service to the iron industry of the United States. The retrospect of the conditions which contributed to the phenomenal and stupendous progress of the iron industry in the United States during the period of time in which the *Iron Age* has been in existence calls attention again to the fact of the rise of the United States from a comparatively unknown factor in the world of trade to the greatest producer of metals in the world. The advertising pages of the issue also bear witness to the enormous variety of articles in the trades of which the *Iron Age* is the leading representative.

RECENT TESTS OF METALS.

By HENRY SOUTHER.

The writer in the January, 1905, issue of THE METAL INDUSTRY, gave figures of a long series of mechanical tests upon various copper alloys in which the wide range of toughness and strength found in various alloys on the market was strikingly illustrated. These cases showed conclusively that the chemical composition as indicated by the analysis of the different alloys is not much of a guide to account for the variations which are liable to occur in the physical characteristics of the alloys and especially as far as their tensile strength and toughness is concerned. In the present article there are shown another series of results obtained in the physical testing of various copper alloys, together with their chemical composition. The figures given are approximate as far as physical results and the chemical analyses is concerned, but they are sufficiently accurate for practical purposes.

The results shown by the figures emphasize again the fact how much difference in the physical characteristics may exist between two alloys of the same chemical analysis. The reasons for these variations are various. In the first place the temperature of the melting plays an important part in the composition of the resulting alloy. The temperature of the mold in which it is cast also has something to do with the mechanical properties. The determinative influence which is exerted on the property of the resulting alloy by the degree of temperature at which the metal is cast has been ably set forth by Mr. Percy Longmuir in an article in the April and May issues of THE METAL INDUSTRY, 1905. Different results in testing are also obtained according to the cross section of the test bar and the shape of it. The results are also influenced one way or the other whether or not the specimen under consideration was tested with the skin on or in the shape of a turned test bar.

It is apparent from the fractures of the specimens in question that the fineness of the grain depends upon the rapidity of cooling, and that fine grain, all other things being equal, gives a stronger specimen than a coarse grain. The following are the results obtained in testing a copper alloy which had the following approximate chemical composition:

Copper	85.0%
Tin	6.0%
Lead	1.0%
Zinc	8.0%

Results of physical tests:

Dimensions .....	.810" dia.	.810" dia.
Elastic limit per sq. in.	16,000 lbs.	17,000 lbs.
Maximum strength per sq. in.	33,000 lbs.	34,000 lbs.
Elongation in 2"	20.%	20.%
Reduction of area	22.%	15.%

Dimensions .....	.810" dia.	.810" dia.
Elastic limit per sq. in.	16,800 lbs.	17,500 lbs.
Maximum strength per sq. in.	35,000 lbs.	36,000 lbs.
Elongation in 2"	25%	28%
Reduction of area	26%	24%

An alloy of the following composition, which is much used in practice for various classes of work, gave the following physical results. Approximate composition:

Copper	88.0%
Tin	10.0%
Zinc	2.0%

The physical results were as follows:

Dimensions .....	.750" dia.	.750" dia.
Elastic limit per sq. in.	20,000 lbs.	20,000 lbs.
Maximum strength per sq. in.	33,000 lbs.	33,000 lbs.
Elongation in 2"	14%	12%
Reduction in area	14%	14%

Another sample tested contained a high percentage of lead and had the following approximate composition:

Copper	80.0%
Tin	10.0%
Lead	10.0%

Two specimens when tested showed the following physical results:

Dimensions .....	.500" dia.	.500" dia.
Elastic limit per sq. in.	21,000 lbs.	24,000 lbs.
Maximum strength per sq. in.	28,000 lbs.	31,000 lbs.
Elongation in 2"	5%	5%
Reduction in area	7.5%	5%

Another series of tests was run on a nickel copper alloy of varying composition. The first sample had an approximate composition as follows:

Copper	72.0%
Tin	10.0%
Zinc	1.0%
Nickel	17.0%

The physical results obtained were as follows:

Dimensions	1.250" dia.
Elastic limit per sq. in.	None.
Maximum strength per sq. in.	23,500 lbs.
Elongation in 2"	None.
Reduction of area	None.

The analysis of the second sample showed it to be composed of:

Copper	68.0%
Tin	8.0%
Zinc	1.0%
Nickel	23.0%

The physical tests obtained were as follows:

Dimensions	1.250" dia.
Elastic limit per sq. in.	None.
Maximum strength per sq. in.	46,000 lbs.
Elongation in 2"	None.
Reduction of area	None.

Bad flaws existed in these two samples.

The third sample showed the following composition:

Copper	67.0%
Tin	—
Zinc	15.0%
Nickel	18.0%

The following physical results were obtained:

Dimensions	1.250" dia.
Elastic limit per sq. in.	15,000 lbs.
Maximum strength per sq. in.	28,000 lbs.
Elongation in 2"	25%
Reduction area	25%

A series of tests were also run upon an aluminum alloy which had the following composition:

Copper	90.0%
Aluminum	10.0%

The series of samples gave the following physical results:

Dimensions .....	.750" dia.	.750" dia.	.750" dia.
Elastic limit per sq. in.	15,000 lbs.	15,000 lbs.	23,000 lbs.
Maximum strength per sq. in.	49,000 lbs.	45,000 lbs.	57,000 lbs.
Elongation in 2" ..	65.0%	55.0%	26.0%
Reduction of area	45.0%	45.0%	25.0%

Dimensions .....	.750" dia.	.750" dia.	.750" dia.
Elastic limit per sq. in.	20,000 lbs.	19,000 lbs.	18,000 lbs.
Maximum strength per sq. in.	52,000 lbs.	51,000 lbs.	50,000 lbs.
Elongation in 2" ..	20.0%	25.0%	22.0%
Reduction of area	24.0%	25.0%	29.0%

Dimensions .....	.550" dia.	.550" dia.	.550" dia.
Elastic limit per sq. in.	28,000 lbs.	26,000 lbs.	23,000 lbs.
Maximum strength per sq. in.	65,000 lbs.	66,000 lbs.	54,000 lbs.
Elongation in 2" ..	20.0%	20.0%	12.0%
Reduction of area	25.0%	75.0%	19.0%

The following interesting series of experiments were run on a metal which the chemical analysis showed to be composed as follows:

Approximate composition:

Aluminum	90.0%
Zinc	10.0%

The results obtained from the physical tests are shown in the following table:

Dimensions	1.05" sq.	1.05" sq.	1.05" sq.
Elastic limit per sq. in.	15,000 lbs.	12,000 lbs.	15,500 lbs.
Maximum strength per sq. in.	17,000 lbs.	16,000 lbs.	14,000 lbs.
Elongation in 2" ...	5.0%	8.0%	4.0%
Reduction of area.	2.0%	8.0%	2.0%

Another aluminum alloy which was composed of

Aluminum	80.0%
Zinc	17.0%
Copper	3.0%

gave the following physical results:

Dimensions .....	.500" dia.	.750" dia.
Elastic limit per sq. in.	None.	None.
Maximum Strength per sq. in.	20,000 lbs.	18,000 lbs.
Elongation in 2"	None.	None.
Reduction of area	None.	None.

ALKALI-RESISTING ALLOYS.

By JESSE JONES.

The best alloy to use in machinery which comes in contact with soap, washing soda, blueing or starches is cast iron with from 1 to 10 per cent. of nickel added. This alloy will resist both alkalis and acids very well and is extremely hard. If the castings are of thin section and are to be machined, the molds should be of dry sand or at least skin-dried, and the metal should be poured very hot.

There are no alloys which are strictly non-corrosive. Those containing zinc, tin, lead, aluminum, antimony or silicon are subject especially to corrosion by caustic alkali. The fewer the metals that enter into the composition of an alloy and the purer these metals are, the better will the alloy resist the corrosions of both acids and alkalis.

SHEARING TESTS OF ALLOYS.

A series of experiments were recently carried out at the London University College Engineering Laboratory by Mr. E. G. Izod in order to ascertain the shearing stress which alloys of various composition would stand. Mr. Izod gave his results in a paper read before the British Institution of Mechanical Engineers on December 15, 1905. He tested various alloys and obtained with them the results which are shown in the following table:

Material.	Ult. Tens. Stress. Tons per sq. in.	Elongation Percentage on Standard.	Ult. Shear Stress. Tons per sq. in.	Per Cent.
Cast aluminum bronze.....	33.1	12.5	19.9	60
Cast phosphor bronze.....	13.4	2.2	17.2	128
Special cast phosphor bronze	19.7	8.0	18.4	93
Gun metal.....	12.1	7.8	12.5	103
Special gun metal.....	19.0	26.5	14.3	75
Yellow brass.....	7.5	6.5	9.4	126
Special yellow brass.....	16.0	35.0	11.8	74
Delta metal.....	47.3	28.3	24.2	51
Rolled phosphor bronze....	39.5	11.7	24.2	61
Aluminum	6.4	25.5	4.5	70
Aluminum alloy.....	12.7	9.6	7.5	59
Wolframium.....	12.6	9.2	7.5	59

The cast aluminum bronze showed a high ultimate tensile stress with a rather low ultimate shear stress and the shear fracture did not show much sign of the knife edges having had a cutting action on the material. It had apparently stood the load up to the maximum without much deformation and had been entirely fractured. In the tensile tests it was noted that the reduction of the area before and at the fracture was not local but extended over the whole length of the bars as though the material was rolled and fibrous.

The cast phosphor bronze gave 13.4 tons per sq. inch of ultimate tensile strength and 2.2 per cent. of elongation. The same material was specially treated in castings with the result that the strength as well as the elongation was improved, the tensile strength increasing to 19.7 per cent. and the elongation to 8 per cent. The ultimate shearing stress which the material would stand was increased from 17.2 to 18.4 tons per sq. inch. The test figures were also improved in the case of the gun metal, as is shown by the figures in the above table.

The improvement due to special treatment of the yellow brass is still more marked than that in the two previous cases. The shear fracture of the Delta metal was fine and clean but presented a curious feature in that the material showed no trace of cutting of the knife edges except at the extreme outside of the specimen. The shear fracture on the rolled phosphor bronze was also very smooth and clean as was the shear fracture of the aluminum.

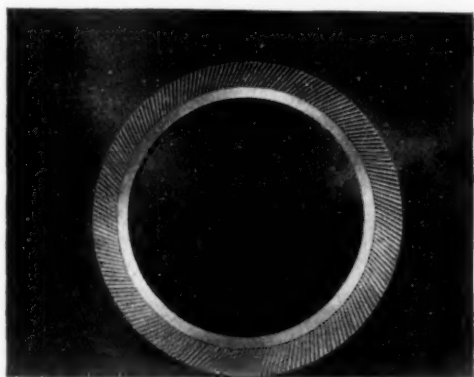
Antimony in small quantities does not affect the good qualities of copper. It was considered that one one-thousandth part of antimony acted injuriously on copper, rendering it useless for the manufacture of brass wire and sheet brass. It has, however, been shown that copper with 0.529 per cent. of antimony can be drawn into the finest wire just as well as pure copper.

Copper is not attacked by water free from air nor by lime water. With the access of air it is oxidized by water which contains alkalis, acids or various salts.

CASTING MANGANESE BRONZE.

The uses of manganese bronze for automobiles and various other types of castings has been increasing considerably within recent years. The following directions have been issued by the manufacturers of Parsons' manganese bronze by William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa. This firm are the sole makers for the United States, Cuba and Mexico of Parsons' manganese bronze:

Parsons' manganese bronze must in most cases be cast in well-dried molds, coated with a wash of plumbago. Plain castings of moderate weight and not very thin may be made in green-sand. It is preferable that crucibles be used in melting in all cases. Many castings have been made, each requiring 17,000 pounds of metal to pour, all of which has been melted in crucibles from which was filled the ladle to be used in pouring the casting.



MANGANESE BRONZE RUNNER FOR STEAM TURBINE.

Where it is not convenient to use crucibles, or enough furnaces are not provided for the required melting, a reverberatory furnace can be used, providing the metal is covered up (when it commences to melt) with small coke mixed with hardwood ashes, charcoal dust, etc. A cupola cannot be used for melting under any circumstances.

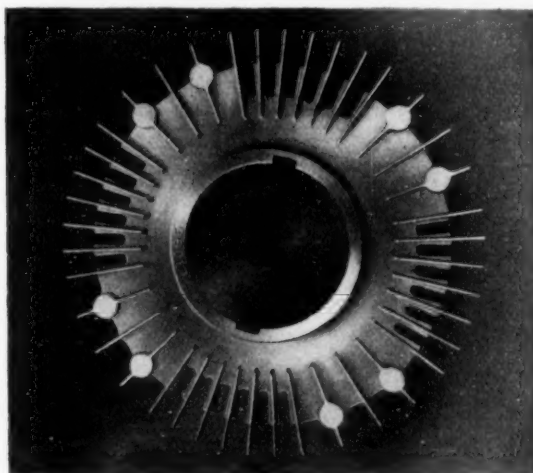
In melting in crucibles, heat the metal until it flares zinc fumes freely, then remove the crucibles from the furnace and skim thoroughly until the flaring has ceased. When the flaring has ceased, pour the metal into the mold. It should again flare zinc fumes as it runs into the mold. If several crucibles are intended to be emptied into a large ladle, do not skim them, but empty them all into the ladle as quickly as possible. Then skim thoroughly and pour the casting. In order to prevent any slag or dross that may form after skimming from getting into the mold, it is recommended that a large and deep basin be used, large enough to hold one-third or more of the metal used in pouring. Into the gate, a stopper or plug should be accurately fitted, which should be removed when the basin is filled, after which the basin should be kept filled until the casting is completed.

There should be as few gates or runners as possible, and, in almost all cases, they should be joined to the bottom of the casting. The only case wherein gating at the bottom was not preferable, was in some long cylinders or liners, about 24 inches diameter and $1\frac{1}{2}$ inches thick, and from eight to ten feet long. These liners were cast at first by gating them from the bottom, and it was found that in several attempts the surface turned up dirty. Afterward they were gated directly on the top, and in every case perfectly sound and clean castings were secured.

The foregoing was the only exception to the rule, that everything should be poured from the bottom of casting. It is also recommended that in all cases where it is at all possible, a large basin be formed around the pouring gate, in which a plug should be kept until the basin is filled.

It is absolutely necessary that castings made from this metal should be thoroughly fed, therefore every casting should be provided with one or more risers, which should be of sufficient bulk to insure that their necks remain liquid until the casting below has thoroughly solidified, and therefore has been thoroughly fed by the risers. A thick, bulky riser is an absolute necessity, and no amount of height without the requisite thickness will answer the same purpose, because if the neck of the riser solidifies before the casting, all the metal above is useless and the casting will be unsound. All risers must be kept open as long as possible, by churning with rods, and if the casting is bulky, they must be fed with hot metal as often as necessary, and until the casting has thoroughly solidified below the neck of the risers.

Consider carefully the best position for the risers, and place them so that they will feed the thickest part of the casting and keep them open by churning until the parts they are to feed are solidified. Make the necks of the risers as short as possible. The neck of the riser should slightly exceed in diameter the thickness of the casting at



MANGANESE BRONZE CASTING FOR ELECTRIC MOTOR.

the point of attachment, the riser should then swell out quickly above the neck to form the body of the riser. Make the diameter of the body of the riser at least double the thickness of that part of the casting it is intended to feed, and the height about the same as for any other metal. In castings with considerable and irregular variations in thickness, all thick parts cut off from principal riser by thinner parts, must have separate risers to feed them.

It is possible and likely that in some castings oxide or dross will form, and it is therefore necessary that runners or gates should be so arranged as to avoid splashing or division of the metal in the mould, and to insure its flowing quietly and quickly upward from the bottom. The gates or runners should be made large enough to fill the mould as quickly as possible. It is always preferable to use only one pouring-gate or runner. In any event, use as few as possible.

In determining the position in which each casting should be made, it is only necessary to decide how the casting should be placed in order to decide how the risers

for feeding should be located to best advantage. In plain work where the casting is to be thick in one part and thinner in another part, cast the thick part upward, in order that it may be fed from the riser or risers. Propeller blades, therefore, should be cast with the flange upward, and so should all work of similar shape, or where the same principles prevail. Castings of irregular shapes and thicknesses must be cast in whichever position admits of the best placing of the risers for feeding. Sometimes it is impossible to make a casting in such a position as to place risers on all thick parts, or on all parts that need feeding. This can be remedied by chilling all parts that cannot be reached by a riser. It has been found that chilling and feeding both answer the same purpose and that, where one cannot feed by risers, the same results can be attained by chilling. Sometimes this end can be attained by using an iron rod in place of a dry-sand core, and at other times by making an iron or brass surface for that part of the mould which cannot be reached by risers.

Each time scrap of Parsons' manganese bronze is remelted it is advantageous to make good the amount of zinc volatilized in the previous melting, and an addition of $1\frac{1}{2}$ pounds of zinc to each hundred pounds of scrap remelted in crucibles, and an addition of 4 pounds of zinc to each hundred pounds of scrap remelted in a reverberatory furnace is recommended.

PURE MANGANESE.

Pure manganese is a substance which up to a few years ago was practically unknown except in chemical laboratories. The invention of Dr. Goldschmidt, of Essen, Germany, however, made it possible by the use of pure aluminum as a reducing agent to obtain practically pure manganese metal on an industrial scale in large quantities. Since that time it has gradually found increasing use as a deoxidizer in the production of alloys and has displaced to a large extent the ferro-manganese which was formerly employed. Another one of the uses to which it is put is the deoxidization of tin and melters of tin report that 100 pounds of pure manganese act successfully as a deoxidizer for 50 tons of tin.

MAGNESIUM METAL IN BRASS CASTING WORK.

Although discovered by Bussy in 1829, magnesium has been until the present time more or less of an unknown quantity in the metal world. However, the progressive spirit of the 20th century in its record breaking quest for new and improved methods for brass foundry work has brought to light the good qualities of magnesium as a deoxidizer in the manufacture of brass castings. European works are now using it with much success, and some of the more prominent and progressive works in this country are regular consumers of this metal. It is probably only a question of time when every foundry of any importance will count magnesium as one of the valuable assets of the business. The only difficulty to overcome is the proper method in which the magnesium is to be added to the mixture. Naturally, the experts will not divulge their secrets. However, the information can be gained by making practical experiments, and the following information will be of assistance:

When the metal is ready to be poured out, cover the mixture in the pot with about one-half to one inch of powdered fluor-spar and then add, without delay, about one-fourth of one per cent. of magnesium in the following manner: The magnesium, which comes in stick form, is cut in pieces of about three inches in length,

and tied together; and then, with the aid of iron tongs, it is pushed to the bottom of the crucible. This movement must be quickly executed, as otherwise the magnesium will burn off before it has accomplished the desired results. After adding the magnesium, the whole mixture must be thoroughly stirred.

Although used chiefly as a deoxidizer, magnesium is also of value on account of its coloring properties. Even a small quantity will influence the tint of copper in the direction of silver-white. An alloy of 10 to 12 per cent. of magnesium with copper is nearly silver-white with a reddish tinge.

It is absolutely necessary to use the very best grade of magnesium for the above-mentioned purpose.

THE MANUFACTURE OF CARTRIDGE CASES.

In a paper recently read before the British Institution of Mechanical Engineers, Colonel L. Cubillo described in detail the new plant recently completed at the Royal Spanish Arsenal at Trubia near Oviedo, Spain, for the manufacture of brass cartridge cases from 3 inch to 6 inch diameter inclusive for quick firing guns. The exact composition of the alloy for these cases is 67 per cent. of copper and 33 per cent. of zinc with a margin of 5 per cent. above or below for either metal. The French Artillery department, which is noted for the care with which its specifications for cartridge case metals are drawn up, not only specifies the above named proportions and variations, but requires that the constituent metals should be of accepted brands.

The author states that annealed copper has a tensile strength of about 13 tons per square inch and an elongation of 45 per cent., while zinc has a tensile strength of 1.336 tons per square inch. The alloy of 67 per cent. of copper and 33 per cent. of zinc, however, has a tensile strength in the annealed state of $19\frac{1}{2}$ tons per square inch, an elongation of 68.9 per cent. and a contraction of area of 29.4 per cent. The stress-strain diagram indicates that the alloy containing 67 per cent. of copper and 33 per cent. of zinc possesses the greatest tenacity and ductibility, and requires in the annealed state a greater expenditure of work for its rupture.

The operation of annealing is of great importance in the process of making cartridge cases, as it has to be repeated many times throughout the process. The manufacture of cartridge cases consists of a series of cold drawing which produce brittleness, which is the more pronounced the greater the deformation. The ductibility must be restored after each drawing by heat treatment carried out between certain limits of temperature and followed by either a sudden or slow cooling. The metal may be annealed at a temperature of 700 to 730 degrees C. (1292 to 1346 degrees F.) and blanks have been annealed at Truvia with good results between 570 and 740 degrees C. (1058 to 1364 degrees F.) according to the thickness of the sheet. The most suitable temperature is 620 to 650 degrees C. (1148 to 1202 degrees F.). On reaching the required temperature, the metal may be cooled either suddenly or slowly, as the speed of cooling does not affect its physical qualities. This has been verified not only by tensile tests but also in the working of the process.

Colonel Cubillo gives several micrographs of annealed brass, showing a crystallized structure of the metal, inasmuch as the thermal treatment by annealing favors the formation of the crystals, the state of which is greater the higher the annealing temperature and the slower the rate of cooling. He also shows metal made brittle by the operation of cold drawing. The structure of the brittle metal differs widely from that of the annealed

metal as the crystals lose their form and finally disappear in a confused and apparently homogeneous mass. The deformation of the crystals is more pronounced the more the cold working of the metal is prolonged.

In the manufacture of the cases, the metal after being formed into a cup shaped disc is subjected to successive drawings. At each drawing the metal is deformed to a point short of the breaking point, every drawing operation being followed by annealing. The earlier operations, while the cartridge case is still short, are carried out in a vertical press, but when the length is such that the manipulation and the withdrawal of the punch become

difficult, the operation is continued in a horizontal press.

It is worthy of mention in this connection that nearly the whole machinery used in the plant was imported from the United States. The Waterbury Farrel Foundry & Machine Company, of Waterbury, Conn., furnished the drawing and heading presses, pumps, accumulator and trimming lathes; the Ferracute Machine Company, of Bridgeton, N. J., furnished punches, dies, etc., and the annealing furnaces were furnished by the Rockwell Engineering Company, of New York. Mr. F. Deming, of Waterbury, Conn., spent two years in Spain erecting the machinery and getting the plant into running shape.

THE COLORING OF SILVER.

BY EDWARD E. NEWTON.

The term "Oxidizing," which is commonly used in the trade to-day as applied to the coloring of silver, is a misnomer, inasmuch as oxygen really plays an insignificant part in the coloring. Sulphuretted hydrogen, on the other hand, attacks the exposed surface of the silver very rapidly and forms a layer of silver sulphide which invariably forms a light yellow color to a decided black, the longer the metal remains exposed.

Various chemicals have been used to color silver and when applied in different proportions have produced slightly different results. Some colors are very useful and ornamental while others are but seldom used. The chloride of platinum solution, for instance, has been used extensively for several years and is still in use to-day as there is nothing that equals the brilliant black produced by this solution when articles are simply immersed in it or when it is applied with a brush. The cost of the platinum chloride is greatly reduced by using it together with tincture of iron. The solution generally used consists of a 25 per cent. solution of platinum chloride to which is added an equal amount of tincture of iron. The solution thus made up will produce a very fine black. The articles to be colored can be immersed in the solution or the latter can be painted over the goods with a brush.

Metallic platinum is soluble in one pint of nitric acid and three parts of muriatic acid (aqua regia). When all the metal is dissolved, the liquid is evaporated almost to dryness and the residual salt is dissolved in water, alcohol or ether. Equal parts of alcohol and water are probably the best. The tincture of iron is then added. It is not necessary to heat the work before applying this mixture to it, although the production of the color is hastened somewhat by warming. If the article is coated once with the solution and does not turn a good black color, the mixture is applied again and the work is then allowed to stand for a few minutes, after which it should be rinsed off well in clear water and scratch-brushed slightly. The next operation consists in relieving or shading the goods and this is performed with muslin buffs and fine pumice stone. A bristle brush is generally used to take out the color in deep parts of the ornamentation.

Another solution for black coloring of silver is composed of 10 dwt. of platinum reduced to the chloride, as explained above, and dissolved in one pint of water. This solution is mixed with 4 oz. of sulphate of copper and 1 oz. of arsenic dissolved in 1 pint of muriatic acid. The sulphide of potassium is used so extensively and is so well known that there is hardly any necessity of going into details. It is still a very valuable oxidizing agent and is used in many different trades on different metals for obtaining a blue-black color. One or two ounces of sulphide of potassium dissolved in one gallon of water is sufficient to do a great quantity of work. The same solution used at different degrees of temperature will

produce any number of shades from a light yellow gold to a blue-black color.

A red color may be produced on silver with tincture of iron. The articles are cleaned thoroughly and the iron solution is applied with a brush, covering the articles all over. The goods will at first turn quite dark and after standing for a few minutes they are rinsed in clear water. They are then scratch-brushed lightly over the surface of the work and dried. With the aid of heat the red color will appear. Different shades may be obtained in this operation according to the temperature to which



COLUMBIA MEDAL FINISHED IN FRENCH GRAY.

the work is subjected. The articles should not be allowed to get too hot as this will spoil the color.

Another method of obtaining a red color on silver is as follows: Dissolve one oz. of nitrate of uranium in six oz. of water and then dissolve one oz. of red prussiate of potash in six oz. of water, keeping both solutions separate. The red prussiate of potash should be kept in an opaque bottle when it is not in use. Both of the above solutions are mixed in equal parts and $1\frac{1}{2}$ oz. of strong acetic acid and 10 oz. of water are added. This solution is used warm but it must not boil. When the articles are thoroughly cleaned, they are immersed in the solution and are kept continually in motion until the desired color is obtained. They are then removed, rinsed in clear water and dried. This solution will produce a splendid red color on the silver and is not expensive. It can also be used on other metals such as brass and copper with very good results.

A green color on silver may be obtained in more than one way. A solution of tincture of iodine is used with very good results and produces an olive green color. The article to be colored should be well cleaned and a solution of iodine should be painted on with a brush until the article is thoroughly covered. The painting should be done two or three times and the work should be allowed to stand for a while damp with the solution. The work is then rinsed well in hot water and dried with a soft cloth. The high lights of the ornamentation may be rubbed over with a soft cloth, thus leaving a slightly different color in the background which gives a very pretty effect. Another method for relieving consists in rubbing the articles with flour pumice until the silver shows through. The work may then be lacquered if desired.

Another green color for silver which is a sort of antique green may be obtained by the aid of a solution which is composed as follows:

Carbonate of copper.....	3 oz.
Ammonium chloride.....	1 oz.
Common salt.....	1 oz.
Cream of Tartar.....	1 oz.
Copper acetate.....	1 oz.
Vinegar.....	8 oz.

These ingredients are mixed together. The article to be colored should be cleaned as usual in all coloring operations and the above mixture applied with a camel's hair brush. If desired the work may be immersed in the solution. No matter in what manner the treatment has been carried out the article should be allowed to stand for a short time and it should then be warmed enough to dry it. The high lights may be rubbed over with pumice stone if desired. This color is very useful in some kinds of ornamental and figure work.

A pink color is usually obtained with the aid of the acid copper solution. A light deposit is obtained and the article is then immersed in hot water and dried. The same color, although of lighter shade, is produced by dipping the work in a hot copper chloride solution and then lacquering it.

In order to obtain a gray color a solution of chloride of palladium is used. The metallic palladium is dissolved in aqua regia in the same way as gold or platinum and

the solution is evaporated until it is almost dry. It is then diluted with equal parts of water and alcohol and used with a brush. A solution of chloride of palladium, however, is too costly to be used for ordinary work. A gray color can be obtained on silver goods with either a chloride of platinum or sulphide of potassium solution. The latter is used mostly on account of the cost of platinum. The French gray color which has been having such a successful run both on sterling and plated goods is produced almost entirely with sulphide of potassium.

As far as the gun metal color is concerned, there are a number of solutions for producing this color on different metals including silver. A coloring solution which I have used with success is made up as follows: Take 4 oz. of chemically pure sulphate of iron and dissolve it in $\frac{1}{2}$ gal. of water. Add enough cyanide of potash to precipitate the iron, pour off the liquid carefully so as to save the precipitate and then add a gallon of water and enough cyanide to dissolve all the iron precipitated. The solution is now ready for use with iron anodes and at a moderate current density.

It is often desirable to obtain different shades of brown and I know of no better solution than the following:

Sulphate of copper.....	$\frac{1}{2}$ oz.
Ammonium chloride.....	$\frac{1}{4}$ oz.
Vinegar.....	3 fluid oz.

A great deal of the success of the operation depends upon the length of time the work is immersed in the solution. If the solution does not take hold at once, scratch-brush the article and dip it again. If a light color is desired, a few minutes of immersion will suffice but if a darker shade is wanted several dips are required, the work being scratch-brushed each time. It is well to lacquer the work after all the coloring is done, as this will preserve it and will insure its lasting considerably longer.

An antique color on silver can be produced with the liver of sulphur solution. After dipping the work in this solution it is scratch-brushed lightly and the high parts are rubbed over with whiting and alcohol mixed together. The color is left in all the ground work. About 8 to 10 drops of chloride of platinum are then added to 3 oz. of water and the work is brushed over quickly with this solution. It is then rinsed in clear water and dried.

OUR BRONZE MEDAL.

The International Jury of Awards of the Universal Exposition, St. Louis, 1904, has just distributed the gold, silver and bronze medals to the exhibitors at that famous World's Fair. Before distributing the medals,

recipient of an engraving and a bronze medal, though our exhibit consisted only of a copy of the paper, presented regularly during the fair, with the Department of Metallurgy.



OBVERSE OF MEDAL.

the jury presented appropriate engravings announcing the various awards. THE METAL INDUSTRY is the pleased



REVERSE OF MEDAL.

The accompanying cut illustrates the attractive design of the medal, which is a beautiful specimen of

skilful die work and fine artistic finish. In the composition of the obverse of the medal are shown two figures, one of which, Columbia, tall and stately, is about to envelope the youthful maiden by her side, typifying the Louisiana Territory, in the flag of the stars and stripes, thus receiving her into the sisterhood of States. The other figure is depicted in the act of divesting herself of the cloak of France, symbolized in the emblem of Napoleon, the busy bee, embroidered thereon. In the background is shown the rising sun, the dawn of a new era of progress to the nation. The reverse side of the medal shows an architectural tablet bearing an inscription giving the grade of the medal.

Below the tablet are two dolphins symbolizing our eastern and western boundaries, the whole surmounted by an American Eagle, spreading his wings from Ocean to Ocean.

The medal was designed by Adolph A. Weinman. The design was approved by a committee composed of J. Q. A. Ward, Daniel C. French and Augustus St. Gaudens.

The dies were engraved and the medals struck by the United States Government Mint at Philadelphia. The alloy for the medals was made especially for the Exposition after samples were submitted and passed upon by expert medalists.

THE HOT GALVANIZING PROCESS.

British practice in hot galvanizing was recently described in a paper read before the British Society of Engineers by Mr. Sherard Cowper-Coles. The following is an abstract from his remarks on the subject:

The process of hot galvanizing consists of dipping the article to be galvanized in molten zinc at a temperature of 800° F. to 1,000° F., dependent on the class of work to be galvanized, after the scale and oxide have been removed. In some cases the iron is annealed before pickling. The chief improvements in the manufacture, from an economical point of view, which have been effected in hot galvanizing, have been in the construction and arrangement of the baths, and mechanical appliances for reducing the weight of spelter to the superficial foot. Iron galvanized by the hot or molten process is usually spangled, due to the crystallization of the metal which takes place almost immediately the iron leaves the molten zinc. Small quantities of tin are sometimes added to increase the size and lustre of the spangles.

The first step of the process is the operation of pickling. Sand blasting is sometimes substituted for pickling, clean sharp sand and iron shot being projected on to the surface at a pressure of 5 or 10 lbs. to remove the mill scale. When using quartz sand of the best quality,

wooden washing-vats, in which they are washed in a stream of fresh water.

They are passed one by one to a bench or table, where a workman with a stiff brush and a triangular-shaped steel scraper, or a small sand blast jet removes such patches of scale as may still adhere. The sheets then pass into a second vat fitted with clean water in which they are allowed to remain for twelve or twenty-four hours.

The washed iron sheets are then immersed for a few minutes in commercial muriatic acid in a wooden or stone tank. This treatment removes every trace of oxide from the sensitive iron skin, forms a thin layer of iron chloride upon it, and renders the iron insensible to oxidizing influences during its subsequent manipulations. From the clearing tank, the sheets are taken to a rack and arranged on edge, to keep them from touching each other. The rack is mounted on a truck and a number of them are wheeled into a drying chamber, and in about half an hour they are ready for dipping in the molten zinc. This process of drying is now seldom employed, the sheets being passed direct into the galvanizing bath. Iron sheets after they leave the rolling mill require annealing, otherwise they are too hard. The plates are placed in wrought or cast iron boxes, the joint between the covers and bot-

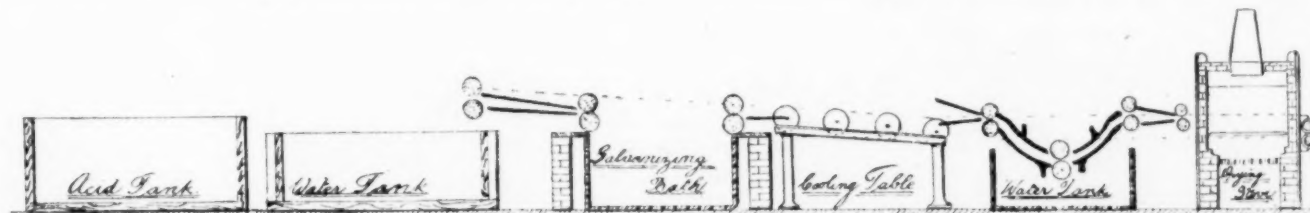


FIG. 1. GENERAL ARRANGEMENT OF PLANT.

the loss is about 10 per cent. each time it is used. The cost of sand blasting under the most favorable conditions, including the cost of labor, sand, and power, is one-tenth of a penny per square foot, but it varies considerably with the nature of the work. The process is too costly for sheets, the surface of which is very large compared to the weight, but it is found advantageous for castings. Small castings and such like articles are placed in rumbling barrels with sand to remove the scale. The operation of pickling is usually carried out in a rectangular tank, the size and shape depending on the class of work. The pickling liquid consists of common commercial sulphuric acid, diluted with from ten to twelve parts of water, or hydrochloric acid, or a mixture of both, which is heated by steam. If iron sheets are to be galvanized, as many sheets are immersed on edge as the tank will accommodate. In from one to two hours the removal of the oxide is effected, the individual sheets are wedged apart to insure the penetration of the pickle. The sheets are withdrawn from the pickle tank and transferred to large

tom is made tight with sand. The boxes are often made to hold as much as 15 tons. The boxes are removed into the heating furnaces on iron rollers, or on balls which roll in V-shaped grooves. The best construction of furnace is with a back and front door, so that a new charge can be moved in simultaneously with removing the plates that have been annealed. The furnace is fired by small coal or by producer gas.

The galvanizing pots are made of wrought iron or steel with riveted or welded joints, and usually contain about 25 tons of molten zinc for sheet galvanizing, although they are often made large enough to contain 200 tons or more of metal when a large variety of work has to be dealt with. The bottom of the galvanizing pot is generally arranged to rest on solid masonry, the brickwork being built up around the pot so as to provide a fire space between the brickwork and the iron pot. A number of draft holes are left in the brickwork which are used for regulating the draft by removing or replacing the bricks. Sheets are galvanized by passing them

through rolls revolving in the molten zinc at the rate of about 1 foot per minute. Heathfield's galvanizing machine will turn out 12 tons or more of galvanized sheets 14 to 30 gauge in 10½ hours. Muriate of ammonia is placed in one end of the bath through which the plates enter, and sand at the other end through which the plates leave the molten zinc.

Messrs. Davies and Sons, of Wolverhampton, introduced a system of wet rolling the plates after annealing and pickling. The advantages claimed are a more uniform coating of zinc with a smaller consumption of spelter. Fig. 1 shows the general arrangement of a plant for galvanizing sheets continuously. Wire is coated with

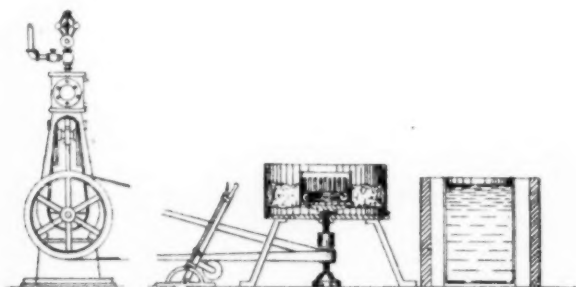


FIG. 2.—CENTRIFUGAL APPARATUS.

zinc by passing a number of wires arranged parallel to one another, through the bath. As the wires leave the molten zinc they are passed through sand or are wiped with asbestos to remove some of the zinc. Another process consists of placing the entire coil in the molten zinc and then removing some of the zinc by centrifugal force in an apparatus as shown in Fig. 2. One of the chief advantages of hot galvanizing, as compared with other processes, is the rapidity with which the work can be done, but the process is more costly than electro or dry galvanizing on account of the large quantity of zinc that has to be kept continuously molten day and night, with the resultant formation of considerable quantities of zinc-iron alloy.

CEMENT FOR FASTENING GLASS TO METAL.

A satisfactory cement for this purpose is made up as follows: A solution of sodium silicate, or concentrated water glass, which should have a specific gravity of 30 deg. Baume, is procured and finely pulverized chalk is stirred into it until the mixture is fine and plastic. This cement should be applied to the goods as required. It takes about 6 to 8 hours' time to dry, but it possesses considerable hardness and is extremely durable.

If any of the following substances are used in place of chalk different colored metallic appearing cements may be produced:

- Sulphide of antimony (metallic appearance).
- Zinc dark or zinc gray (metallic appearance).
- Carbonate of copper (bright green cement).
- Cobalt blue (blue cement).
- Vermilion (a splendid red cement).
- Carbon red (violet cement).

The United States Government prescribes in its contracts when cementing metal to glass the use of concentrated commercial glycerine mixed with litharge. This formula is used on all marine work.

There is a growing demand in China for copper for coining purposes, the American 99.6 electrolytic copper being very popular because it can be worked to advantage in the mints.

COPPER PLATING ON IRON CASTINGS.

BY CHARLES H. PROCTOR.

Sometimes more or less trouble is experienced in getting a deposit of copper on iron castings. Recently the writer came into possession of a sample casting intended for a lawn sprinkler. These sprinklers, of course, are frequently in a wet condition and ordinary copper plating therefore soon comes off and the sprinkler becomes rusty. The particular casting under consideration had been galvanized first and the copper plating had been put on the galvanized surface. This was not satisfactory, as some chemical action probably took place between the galvanizing and the copper plating, and at these places the casting turned black and the copper plating dropped off.

From experiments made in the writer's laboratory with the sample of lawn sprinkler he is of the opinion that the non-adhering deposit results from the galvanic action which takes place in the solution while the copper is being deposited on the galvanized surface. The method which was used for plating this particular sample was probably as follows: The sprinkler was electro galvanized in the first place and the zinc deposit was



COPPER PLATED IRON SPRINKLER.

covered with copper in a cyanide of copper bath, and the finishing was done in an acid copper bath in order to obtain the requisite thickness of the metallic deposit.

Following this impression the copper and zinc deposit was removed entirely from the surface and subsequent operations were conducted in the following manner: The sprinkler was first electro galvanized and a deposit was obtained which was perfectly homogeneous and perfectly adherent. In the next operation the zinc surface was coated in the cyanide of copper bath for five minutes and the deposit obtained in this bath was also satisfactory and adherent. After the sprinkler was carefully washed it was immersed in an acid copper bath for one-half hour. This procedure produced a deposit equivalent to the deposit on the sample when it was received.

After washing and drying the deposit it was carefully examined and there were found very minute blisters. When these were broken up by the aid of the point of a penknife it was found that the copper and zinc deposits could be entirely removed in exactly the same manner as had happened with the sample under consideration. It thus appears that by the galvanic

action which takes place between the copper and zinc hydrogen is formed on the surface of the iron beneath the zinc deposit and in this manner the zinc is separated from the iron and the copper which is deposited on the zinc of course comes away at the same time.

In order to obtain a more satisfactory deposit the entire deposit was again removed from the surface of the sprinkler and the operation was now conducted in the following manner. The iron surface was thoroughly cleaned and immersed in a cyanide of copper bath for 4-5 minutes. The article was then immersed in a nickel bath until the copper coating was completely covered. This operation occupied 4-5 minutes and was followed by the customary washing. The sprinkler was

then directly immersed in an acid copper solution for a period of one-half hour. It was then washed acid dipped, dried out and lacquered. The result of these operations was a perfectly homogeneous deposit of copper and this will, no doubt, prove to have greater lasting qualities than the one obtained by the first method.

The writer is of the opinion that tinning, electro galvanizing or a suitable copper deposit should be a satisfactory finish for this class of articles if it is applied properly. He does not think, however, that galvanizing and coppering will prove successful unless a specially prepared cyanide of copper bath is used, which will give a deposit of sufficient thickness without resorting to the acid copper bath.

THE USES OF ALUMINUM.

By G. R. GIBBONS.

(Concluded from January, 1906.)

The second class represents one in which persons frequently go astray, both in the matter of endeavoring to use aluminum where it is eminently unfitted and in failing to respect its peculiarities in well chosen uses. Purity is the principal consideration in the ordinary application of aluminum under this class: Generally speaking, aluminum is incorrodible in proportion to its degree of purity. Certain reagents attack aluminum very rapidly, and it should never be expected to withstand their action. Such are alkalies, hydrochloric acid and other halogen acids, which are its natural solvents. Although subject to attack from several other acids, generally speaking it yields less readily than other commercial metals excepting lead. Ranked according to its resistance to their attack the more common acids would stand as follows: Phosphoric, nitric, sulphuric, acetic, hydrofluoric and hydrochloric. There is a wide gap between the last two and those preceding, and the first two will affect aluminum very slightly. It is also true that aluminum will corrode in a damp, poorly ventilated place, but will last indefinitely when exposed under ordinary weather conditions.

A very pronounced fact in favor of aluminum, and one which renders it the most sanitary of all commercial metals, is that none of its combinations when corrosion does occur are in the least harmful to the human system. This has been frequently and irrefutably proved by severe experiments, and to this fact is largely attributable its use in this class. In consequence it is used for cooking utensils wrought and cast, spoons, forks, meat can top linings, jar tops, cream rules and separator parts, refrigerator linings, table covers, candy trays, canteens, mess kettles, tooth brush backs, beer coolers and many others. In view of its resistance to certain acids and fumes, aluminum is used for dipping baskets, especially in nitric acid, tank linings, dye tanks, aniline evaporating pans, and in gun cotton manufacture. Since the products of combustion of coal do not seriously injure it, aluminum is being tried for smoke flues in round houses. Cream of tartar producers find it serviceable, and few metals which compare in cost are so durable in salt plants. A very large field of use is created by its imperviousness to the action of sulphur, which attacks most metals; this is in the manufacture of rubber, where it appears as mandrels, forms, labels and pans in the vulcanizing process, which does not injure the aluminum at all. Rubber boot manufacturers are also employing it as lasts, which outlast the wooden ones, and can be melted up into other shapes as the styles or demands change.

Under this division should be mentioned also the marked affinity of aluminum for oxygen, whereby it becomes a valuable deoxidizing agent. For this reason it is introduced into steel in small quantities with the result that the steel is considerably improved. Another standard use of this kind is that as a purifying agent for the zinc galvanizing bath. When so used a better lustre is imparted to the zinc, the impurities are brought to the surface as dross, and the bath is made more fluid. Based on the same principle it is a consistent in thermit, which is utilized for welding steel in place. By a rapid deoxidation of the ferric oxide in the thermit by the aluminum an intense heat is generated.

While not assuming to rank with silver, aluminum nevertheless so closely simulates the color of the precious metal that it finds frequent substitution therefor, as in communion sets, chafing dishes and other tableware. The consumption attributable to this property is sufficiently extensive to form the third class. Satin-finished aluminum is especially popular, and it also permits of a very high and unusually durable polish. The advertiser finds no more catchy novelty or sign than that of aluminum, nor more attractive material for boxes to contain drugs, lotions and soaps. This is also true of medals, checks, badges, figures and letters, of which a variety are marketed, and the popular nameplate machine has ground out hundreds of miles of aluminum. The satin-finished aluminum sheet has few superiors, and when polished furnishes an excellent reflector for stage work, bicycle and automobile lamps and locomotive headlights, in which it is little tarnished by the gases of combustion. It is also well suited for engine lagging, showcase moldings, buckles, stereoscope frames and several other articles, owing to its combination of color, workableness and cheapness.

The fourth class of uses owes its existence to the electrical properties of the metal. Pure aluminum ranks 62 in the Mathiessen standard scale and copper 97. It is the only metal which can compete with copper in the very large field of electrical conductors. Aluminum conductors weight 47 per cent. as much as equivalent copper conductors, are 1:57 times larger in cross section and are practically as efficient in every way. Of recent years this metal has found high favor as transmission lines and railway feeders, of which some 35,000 miles have been installed and successfully operated. Other uses of a similar nature are for bus bars in power stations, rail bonds and various forms of electrical apparatus which require high electrical conductivity.

The fifth class, as outlined, comprises those general

uses into which aluminum has been drawn on account of its several physical properties of high mechanical value, coupled with its low cost. It is capable of being wrought in a marked degree by drawing, spinning, beating, etc., and only finds a stumbling block in the matter of soldering. It would be impossible here to do more than mention a few of the more important uses of this class. Among such are telephone diaphragms, mouth pieces and receiver caps, sounding bars of telegraph instruments, electrical meter discs, cups, frames and cases. In consequence of the high coefficient of expansion it is found in incubator rheostats. From it are stamped shade roller parts, pencil tops, ferrules, buttons and chains. An interesting use which aluminum shares almost exclusively with the cumbersome and expensive stones is that for the lithographic plates, for which it is eminently suited. A promising use on a much larger scale is for railway car linings and racks, for which it is adapted on account of its color, lightness and sanitary qualities.

Space forbids the mention of further uses under the several classes, nor can the reasons here be explained why aluminum is preferred in those places in which it is found. In some cases its adoption is due to properties which it possesses exclusively; in others, commercial reasons have decided in its favor. Its characteristics and prices bring it in most direct competition with brass and copper, but in some cases superior qualities enable it to replace the more expensive tin and nickel and even the cheaper metals, zinc and lead. While not enjoying sufficiently distinctive characteristics to justify the assertion that with certain other metals it may claim some age as all its own, the above review of its wide and increasing application to present day needs during an active career of little over ten years gives assurance of the very important part that aluminum will play in future ages.

12,000 MILES OF ALUMINUM WIRE.

In a column article on "Niagara's New Electric Era," the New York *Sun* mentions that the Niagara, Lockport and Ontario Power Company is planning to transmit electric power from Niagara to Syracuse, 160 miles away, and is considering a transmission line to Cleveland, a distance of 200 miles. It is stated that the power company in the enterprise to Syracuse alone will use 12,000 miles of heavy aluminum wire. This length of wire will be used in three cables which are to carry the power and which are to have 19 stands each. The power will be sent over these cables at a voltage of 60,000.

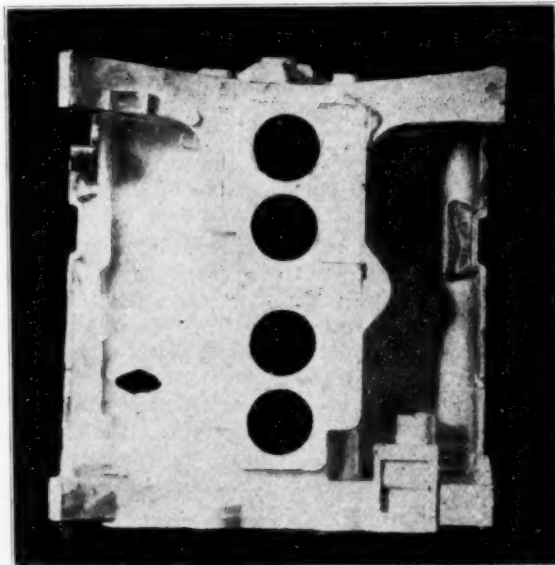
The production of tin increased from 90,978 tons in 1903 to 94,575 tons in 1904. This increase, however, is stated to be perhaps due to the fact that considerable quantities of tin were held back in 1903, thus making the production for that period appear smaller than it really was. The fact that the Straits in 1904 shipped 5,300 tons more than in 1903 is considered to confirm this assumption.

The alloys of gold and copper are less malleable, harder and more elastic than gold and possess a reddish tint. Those with less than 12 per cent. of copper are fairly malleable, but when more than this is present they are more difficult to work on account of the hardness.

Tin has been known from remote antiquity and as early as the eighteenth dynasty in Egypt bronzes containing 10 per cent. of tin were used for tools and other purposes.

ALUMINUM AUTOMOBILE CASTING.

The accompanying cut is one of the aluminum castings made by the Light Manufacturing and Foundry Company, of Pottstown, Pa., who are making a specialty of aluminum and bronze castings for automobiles, also bearing metals. The company had an interesting exhibit at the recent New York automobile shows. An examination of the various castings they make in aluminum and other metals, aluminum particularly, shows them to be of the most intricate shape. The company claim that their



ALUMINUM CASTING.

aluminum castings have greater tensile strength than has yet been produced. In manganese bronze their shipments are guaranteed to exceed Government specifications, which are as follows:

Strain per sq. in. in lbs.	65,000
Elastic limit per sq. in. in lbs.	30,000
Elongation in 2 in.	15%
Reduction of area.	25%

They also make an "Automobile Brand" Plastic Bronze for a bearing metal.

THE AUTOMOBILE SHOWS.

The recent New York automobile shows at Madison Square Garden and the 69th Regiment Armory might be called expositions of brass, copper and aluminum, for a view of either show from one of the galleries gave a striking example of how much brass, copper and aluminum is used in the construction of the automobile. There was a mass of golden colored metals on about every machine and appliance and some of the exhibits of sundries were all gold, all white or red, according to the fittings and accessories to which the exhibitors related. It was brass, copper and aluminum everywhere and considered from a business standpoint was convincing evidence of how the non-ferrous metal industry has prospered since the coming of the automobile. A list of the firms who took part in the special exhibits of brass, copper and aluminum fittings will be found on another page.

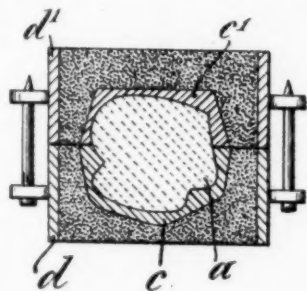
Oxygen is stated to occur frequently in zinc in the form of zinc oxide and when present in considerable quantities it produces a pasty metal, the so-called burned zinc, which gives castings without sharp edges and which are brittle and difficult to work with a chisel and file.

MOLDS FOR COMPLICATED PATTERNS.

A recent invention aims at producing a mold into which metal may be cast for models or patterns even of the most complicated nature. It consists in mixing suitable ingredients with the mold forming mass, which latter is plastered into the models or patterns in a pasty consistency. The ingredients impart to the mass the property of being elastic or flexible for a certain time, so that the mass which subsequently forms the mold can be removed from the pattern without damaging the impression obtained. This mass is subsequently rendered quite hard so that it retains the impressions even to the smallest details. After having been dried, it forms the mold into which the metal is cast.

The material of which the mold is made may be sand, infusorial earth, pipe clay, wood or coal dust, tow waste, molasses, or the like, together with a suitable binding medium such as Plaster of Paris, rosin, glycerin, etc. This is mixed with a solution of an elastic material such as glue, gelatine, caoutchouc, or the like. The mass thus obtained is pasted on the pattern and will become flexible in a short time, but remains sufficiently tough to enable it to be moved without breaking or tearing. It is then stripped or carefully pulled off the pattern and subsequently becomes perfectly rigid. This is owing to the fact that the binding medium does not harden at once on account of the effect of the elastic substance on it, but will do so only after the lapse of some little time.

Substances are then added to the fluid mass or are coated on it which are capable of rendering the elastic substances, such as glue, gelatine, etc., insoluble. Such substances are, for instance, alum, chromates and formalin. When the mass thus obtained is dried, very strong molds are stated to be obtained, from which the elastic substances may either be burned out or may be removed by suitable dissolving acids. By this means the necessary porosity for gases should be attained which may be increased by adding suitable materials such as rosin, tow waste, coal dust, or the like, which will burn out when the mold is dried.



THE MOLD.

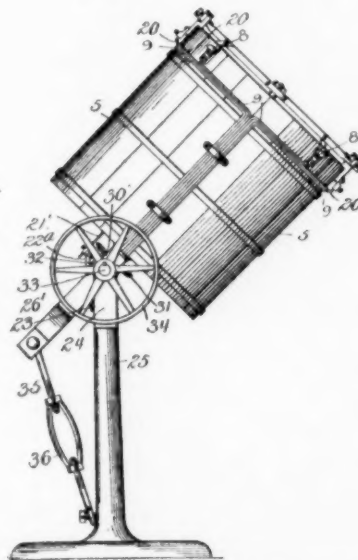
The invention is carried out in the following manner: For instance, in molding the bust A, shown in the accompanying figure, which is assumed to have many recesses and undercuts half of the model is imbedded in the sand B and a thin layer C of the mass previously described is applied to the other half. The exterior of the mass is then smoothed over and the mold box D is placed over the upper half and sand E stamped on it. The whole model is then turned over and treated in exactly the same manner. Now the two parts D and D' of the mold box are removed and the elastic flexible layers C C' will remain on the model. The flexible coating, which forms an accurate mold, may then be carefully taken or stripped off the model and each half laid in its respective box, where it is allowed to harden.

The method of producing the mold forming mass consists in melting about 75 grammes of the best gelatine in

about 1.56 litres of water slightly warmed, 1.4 kilograms of finely sifted molders' sand are mixed with 1 kilogram of the best Plaster of Paris, and this mixture is added to the gelatine solution. The whole is then thoroughly stirred, after which the mass is ready for use. The method above described has been patented in the United States, with Patent No. 805,144 of November 21, 1905, by Max Kuller, of Budapest, Hungary.

ELECTROPLATING APPARATUS.

The accompanying cut shows an electroplating apparatus which has been patented by A. W. L'Hommedieu, of Chicago, Ill., assignor to Chas. F. L'Hommedieu with U. S. Patent 809,309, January 9, 1906. The apparatus consists of a plating tub in which is located four anodes, suitable connecting devices being provided. The cathode consists of a metallic pan, which is located in the bottom of the tub so that it can easily be removed if desired. The cathode is surrounded by a perforated cylinder of wicker work or other non-conducting material.



ELECTRO-PLATING APPARATUS.

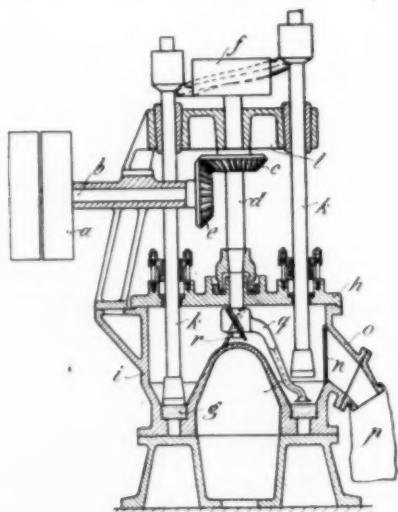
The cylinder is placed between the electrodes of the tub and holds the material which is to be plated, preventing it from coming in contact with the anodes. The basket or perforated cylinder may be lifted from the tub together with its contents. The anode can also be removed without taking out any particular quantity of solution and thus removal of the material to be plated can easily be effected. The tub is rotated so that all the surfaces of the article are exposed to the electrolytic action. The power is applied to the driving pulley 34.

Two or three ounces of commercial sulphuric acid added proportionately to an equivalent of a 100-gal. nickel solution will sometimes work wonders in bringing up a good, clear, white nickel deposit.

The International Association for Labor Legislation of Basel, Switzerland, has invited an international price competition for the prevention of lead poisoning. A number of prizes have been established for the best treatise on the prevention of lead poisoning in those trades where raw and manufactured lead are used on a large scale, such as in smelting and refining works.

MACHINE FOR POWDERING METAL.

In the accompanying figure is shown a machine for finely pulverizing metal, which has recently been patented by F. Sporer, of Nürnberg, Germany, with U. S. Patent No. 805,241, of November 1, 1905. The figure shows a cross-section of the apparatus. Power is furnished by means of the pulley A and shaft B, which latter carries a bevel wheel E meshing with a small wheel C on the vertical main shaft D. At the top of the main shaft D is arranged a lifting worm F which acts in conjunction

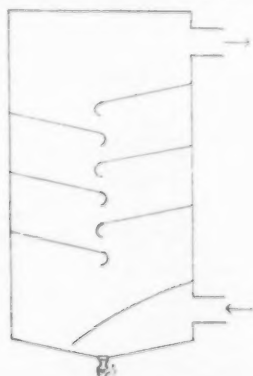


METAL STAMPING MACHINE.

with a series of stamps K arranged in a circle in such a way that the worm in its rotation successively lifts the stamps slowly and allows them to fall suddenly. In order to overcome the difficulty present in former apparatus of this kind on account of the tight packing of the material which was being reduced to powder, and consequent lost work of the stamps, arm Q is arranged on the lower end of the shaft D which lifts the material to be stamped up immediately before each blow. The hub of the stirrer arm Q also carries two wind vanes which produce air eddies and so force the finished metallic powder up through the sieve N and into the sack P.

AN OIL SEPARATOR FOR BLOWERS.

Theodore H. Sippel, Newark, N. J., whose sand blast was illustrated in THE METAL INDUSTRY of July, 1905,



OIL SEPARATOR.

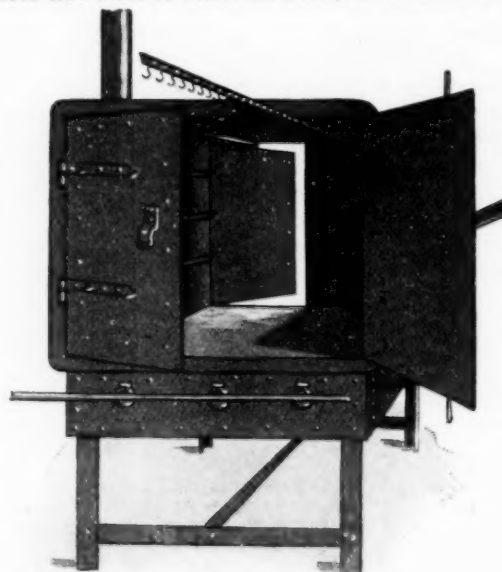
has perfected and placed on the market a device for separating oil from the air of the blower circuit of annealing furnaces, metal melting furnaces, etc. The oil works into the air from the blower bearings, causing not only dirt and inconvenience due to oil dripping from the

piping, but lowers the efficiency of the air blast and impairs the working of the furnaces as well.

The separator consists of a galvanized iron tank with a system of internal diaphragms, substantially as shown in the cut, upon which the air impinges in its zig-zag course from inlet to outlet, thus being freed from the minute oil globules. The separator has been in successful operation for some time in several large factories and it is reported that it will collect about a half pint of oil per month beside keeping the pipes clear of dripping oil.

NEW BRITISH LACQUERING TABLE.

A new lacquering table constructed by Hyde Brothers & Timings, Northwood street, Birmingham, England, is finding much appreciation among jewelers, metal workers and others. It consists of an ordinary gas-heated lacquering table on which is fixed a wrought-iron drying oven or enamelling stove. The interior is equipped with hooks and racks on which to hang or fix the lacquered articles during the drying operations. At the top is a flue to carry off inflammable or injurious vapors, and at either end there are folding doors, enabling operations to be carried on simultaneously by two sets of workers. From the economical point of view, it enables a manufacturer, who does not wish to build an oven, to utilize his lacquer-



LACQUERING TABLE.

ing table by simply placing upon it this oven to which the lacquering table serves as a kind of floor. Being very substantially built of angle iron and 18-gauge steel plates it is very durable. The size may be varied to suit the customer, but commonly the dimensions are from 2 to 8 feet. From the purely British point of view, an important merit is that the oven meets the requirements of the Home Office as to the safe disposal of inflammable vapors. It uses the heat of the table for its proper purpose, instead of allowing it to circulate round the room to the injury of the employees. It can be used equally well for hot and cold methods of lacquering.

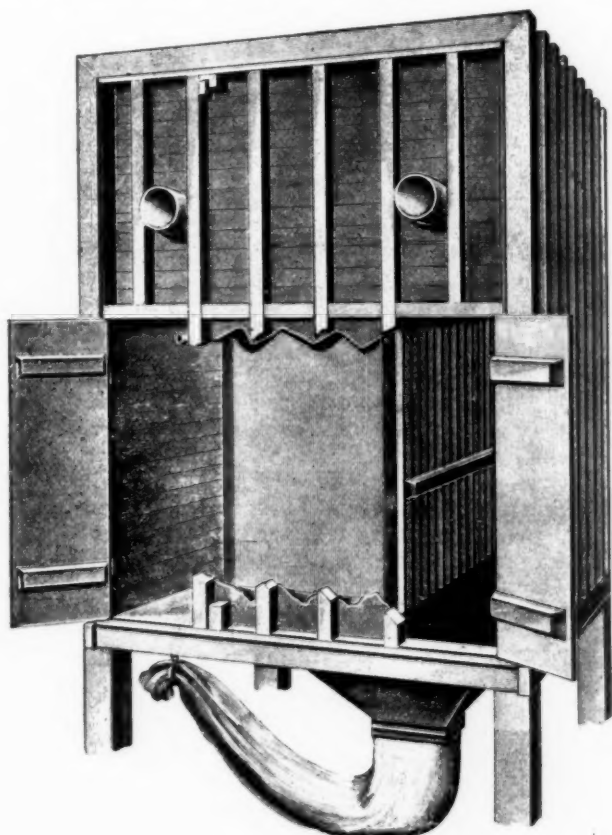
If brass solutions have a tendency to plate reddish when the proper amount of copper is in solution, a solution made up as follows:

Cyanide	1/2 lb.
Carbonate of zinc.....	1/2 lb.
Ammonia water.....	1 qt.

portions of which are added to the bath after stirring well, will bring up a beautiful yellow brass deposit.

DUST ARRESTER.

One of the new appliances brought out for shop equipment is the patent dust arrester shown in cut. It consists of a case containing a battery of cotton screens through which the dust cannot pass. The dust laden air enters the chamber at the right and is exhausted by the fan at the left. The screens form a dust tight partition which holds the dust, but allows the air to pass through. By the means of this arrester the dust is continually being taken out of the air and prevented from finding its way to every part of the works to the annoyance and discomfort



DUST ARRESTER.

of the workmen and to the destruction of the machinery and damaging of goods, generally increasing the cost of production. By confining the dust in the arrester the manufacturer will add to the efficiency of the workmen, save their health and prolong their lives. The makers of the arrester, the W. W. Sly Manufacturing Company, of Cleveland, Ohio, claim that it is the only perfect dust arrester ever put on the market. A specialty of this company is foundry equipment.

The patent laws of Mexico are very liberal and afford good protection to inventors, which fact American inventors should bear in mind.

A suggestion has been made to use pure metallic nickel for coinage purposes instead of the alloy of copper and nickel by reason of its greater resistance to wear, increased scrap value and greater difficulty in counterfeiting.

Copper discs the same size as the coins which are made from them are made in England, Germany and Japan, and said to be more profitable for export to China than ingots. There is also a demand for copper strips $2\frac{1}{2}$ to 3 inches wide of the same thickness of the coin.

BELT POLISHING MACHINE.

The accompanying cut shows a polishing machine with patent belt attachment. The manufacturers say this attachment is quickly and easily operated and is well adapted for belt polishing. Among the advantages claimed for the machine are that it is built with an overhang of the spindle which adapts them to a wider range of work; that they have a superior design,



BELT POLISHING MACHINE.

are strongly constructed, the bearings are long and self-oiling and the spindles are ground to fit the bearings. When desired these machines are fitted with spindles for polishing wheels or flange wheels to be used in connection with the patented strapping attachment shown in cut. The machines are manufactured by the J. G. Blount Company, Everett, Mass.

SMALL WATER MOTOR.

A motor which will furnish power for small lathes, buffing wheels and grinders is shown in the accompanying illustration. It is a water motor and is so constructed that it can be connected to any faucet and can be attached or detached in very quick time. With the No. 150 nozzle it gives a full $\frac{1}{8}$ horse power on 80 pounds pressure from city mains. The size of the nozzle ordinarily is that best suited for general water pressure, but for pressures of 80 pounds or more larger nozzles will be furnished.



WATER MOTOR.

The normal free speed of the motor at 80 pounds pressure is 4,500 revolutions per minute, the speed and power varying with the pressure. All the parts are interchangeable. The connection for the faucets being a swivel, the motor shaft can be placed at any desired angle. The buffing and emery wheels can be attached or detached in a few seconds. The motor is built by the Divine Water Motor Company, of Utica, N. Y.

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York.

METALLURGICAL.

Q.—I am going to cast novelties in an alloy as near as possible to sterling silver. Which of the two alloys mentioned below is the better?

GERMAN PLATE.

Copper	55 parts.
Nickel	24 parts.
Iron	2 parts.
Tin	3 parts.
Zinc	16 parts.

GERMAN SILVER.

Copper	55 parts.
Nickel	21 parts.
Zinc	24 parts.

I intend to add 25% of fine silver to the alloy.

A.—Of the two alloys mentioned the second one would probably prove the better as iron and tin produce very hard alloys. 1% of lead will make the metal more fluid for casting. You might try the following composition:

Copper	54 parts.
Nickel	20 parts.
Zinc	25 parts.
Lead	1 part.

Alloys containing silver for casting may consist of:

Silver	20 parts.
Nickel	25 to 35 parts.
Copper	45 to 55 parts.

Moussett's silver alloy contains:

Copper	59½ parts.
Silver	27½ parts.
Zinc	9½ parts.
Nickel	3½ parts.

Or

Silver	33 parts.
Copper	37 parts.
Nickel	25 parts.
Zinc	5 parts.

Q.—Please inform me what you consider the best alloy known for use in machinery which comes in contact with soap solutions, washing sodas, bluing and starch solutions. Is there anything strictly non-corrosive?

A.—An alloy which is claimed to be practically non-corrosive consists of the following proportions:

Copper	75.75 parts.
Tin	11.00 "
Lead	9.00 "
Antimony	4.25 "

An alloy which is used a great deal in paper mills, etc., consists of the following proportions:

Copper	75%
Lead	15%
Tin	9.9%
Phosphorus .....	.1%

There is no absolutely non-corrosive metal known, but the above formulas are claimed to give good results.

Q.—What advantages and what action has phosphor-tin on a yellow brass mixture in which there is a liberal

quantity of zinc? The castings are for plumbers' brass work and must stand water pressure.

A.—Aluminum and manganese are better than phosphorus for a yellow brass mixture, as they both alloy readily with the zinc. For castings that must stand air or water pressure, however, they are not recommended. A good way of cleaning up yellow brass is to hold scrap leather or a potato under the surface of the metal with the tongs. If phosphor-tin is used only a very small proportion should be added as too much of it will cause blow-holes in the skin of the castings.

Q.—I would like to inquire about the average life of a good crucible used in a coke fire. What I mean to say is the greatest amount of heats which have been taken off with a graphite crucible. Please advise me what causes the crucible to become lined up inside. I have them line up nearly three inches thick and become so hard that the deposit cannot be removed.

A.—The life of a crucible, like many other things, depends upon the care which is taken of it. It has been claimed that as high as forty heats have been taken off with a graphite crucible, but in practical experience twenty-five heats is probably a fair average. The soaking of the metal after its proper heat is reached burns out many crucibles in a short time. The lining referred to is probably a vitreous slag composed of the oxides of the metals used. It may be possible that the proper flux is not used for the metals.

Q.—In using stick phosphorus in place of phosphor tin, how much stick phosphorus is equal to a pound of phosphor tin? Where could I secure stick phosphorus?

A.—Phosphor tin usually consists of a 5 to 10% mixture, that is to say, it contains 90 to 95 parts of tin and 5 to 10 parts of phosphorus. The alloy contains less than ½ to 1 oz. of phosphorus to each pound of tin. Phosphor tin or phosphor copper is the best way of adding phosphorus. When adding the stick phosphorus, unusual care must be exercised in order to incorporate it with the metal, as it usually floats on top. When it is added in the shape of phosphor tin or copper the cleaning action of the phosphorus commences at the bottom of the crucible. Stick phosphorus may be obtained from foundry supply houses or from chemical houses.

Q.—Please furnish me with some information to enable me to bend glass by the use of a blow-pipe. We can successfully bend small pieces but do not succeed with larger sizes, say 12x12". We have no trouble with pieces 6x6".

A.—The reason why you are unable to bend larger sized pieces of glass than 6x6" with the aid of a blow-pipe as well as you can bend smaller sizes is probably because the heat required is not perfectly distributed over the entire surface. A remedy for this is in connecting up a series of blow-pipes so that the entire surface necessary for the bending is entirely covered, including the outer edges of the piece. It may become necessary to rig up a hollow iron tube sufficiently large for the purpose with provisions made for heating the interior with the blow-pipe flame. By placing the glass in such a manner that the heat exerts its action on both sides no trouble should be experienced in bending.

CORRESPONDENCE DEPARTMENT

In this Department we will answer any question relating to the non-ferrous metals and alloys. Address THE METAL INDUSTRY, 61 Beekman St., New York.

Q.—I would like to inquire what is the proper facing sand for cash register work that will dry and make nice smooth castings?

A.—Windsor locks sand mixed with a little stale beer makes the best facing sand for cash register work. The molds should be dried and dusted with lycopodium mixed with flour. The metal should be poured at a good heat in order to produce smooth castings.

PLATING AND FINISHING.

Q.—I have trouble in silver plating steel knives. They peel when they are burnished. Kindly give me a receipt for a silver strike direct on steel without applying first a nickel strike.

A.—Unusual care is necessary for the production of a satisfactory deposit upon steel knives and at least two or three striking solutions of varying composition are necessary. The first striking solution should contain cyanide of potassium only and copper anodes should be used. The solution should stand at 3° Baumé. No deposit will be produced in this solution as it is only intended for the evolution of hydrogen. The second striking solution should stand at 5° Baumé in cyanide and should contain $\frac{1}{8}$ to $\frac{1}{4}$ ounce of silver to the gallon. A copper and a small silver anode should be used in this bath. Its operation will produce a pinkish film of silver. If you find it necessary to use a third striking solution, this should stand 5-6° Baumé in cyanide and contain $\frac{1}{2}$ ounce of silver to the gallon. The work should be immersed in the first bath for $\frac{1}{2}$ minute and then removed into the second bath for the same length of time. The same should be done with the third bath. The articles are not washed between immersions as they are taken directly from one bath and dipped into the other and then directly into the silver bath. When the first striking solution commences to deposit copper after it has been used for some time more cyanide should be added in order to prevent the deposition. It should be possible to overcome the troubles experienced in silver plating when the above described method is used.

Q.—Please inform me how to reduce chloride of silver to a metal.

A.—Chloride of silver may be reduced to a metallic state by mixing it with four times its weight of carbonate of soda and half its weight of pulverized charcoal. The ingredients are mixed thoroughly and then introduced into a crucible. They are heated until fusion is complete. The reduced metal should be cast in a mold or, if granulated silver is desired, it should be poured into cold water, the crucible being raised a certain height above the vessel in which the water is contained.

Q.—Kindly favor us with a method or formula for plating which will give a finish similar to red mahogany.

A.—In order to produce a good red mahogany finish the article should be plated in an acid copper bath which is made up by using 24 oz. of commercial sulphate of copper and 4 oz. of commercial sulphuric acid to each gallon of water used. It is only necessary to plate the articles five to ten minutes for the production of this finish. After they are plated they are well washed and immersed in a solution containing $\frac{1}{4}$ oz. of sulphuret of potash to each gallon of water used.

This solution should be used only slightly warm. When the articles are immersed for a few seconds iridescent colors will be produced. The articles should then be removed quickly and washed and lightly scratch-brushed with a fine brass wire brush. A small amount of sal soda should be added to the water used for brushing. The articles should then be dried and lacquered. The lacquer brings up the tone and finish.

Q.—Kindly give me a good mixture on the order of a lacquer which I can use on brass and copper work polished so that I can use it for dip and brush. The lacquer must be cheap. I tried the water lacquer, but found it too thin. It also shows rainbow colors and does not dry quick enough.

A.—The formula for the water lacquer was given primarily for cheap acid dipped brass goods. You will note that in the January 1906 issue of THE METAL INDUSTRY Mr. Onions claims to have obtained better results by adding a small amount of bicarbonate of soda. You might increase the amount of gelatine to 6 oz. The cheapest successful varnish lacquer that can be used for dipped or brush work and gives the best results is made from one part of French varnish cut in wood alcohol. It is reduced for brush work with 2 parts of a solution made by mixing equal parts of benzol and fusel oil. For dipped work 3 parts of the thinner may be used. A lacquer prepared in this manner dries very rapidly.

Q.—I should like to know how to make Bornheim matt. Is it sand-blasted, or how is it obtained?

A.—Bornheim matt is a sand-blasted finish which is afterwards bright acid dipped and lacquered with a very light colored gold lacquer. This method of operation produces an ormulu gold effect.

Q.—I have a silver solution of about 200 gallons made of chloride of silver and potassium cyanide. It has been working for a number of years with revivings of chloride of silver and cyanide. At present it stands at 25° hydrometer and contains 3 oz. of silver to the gallon. It deposits rather slowly, but the work is plated beautifully, and hollow ware comes from the solution nice and white inside. The anodes, however, become black and dirty and the iron wire on which they are hung is acted upon by the solution. It becomes covered with a scum and the wire is sometimes eaten off. What do you think causes the action on the anodes and the wire? The same solution richer in chloride deposits very rough and lumpy, but as it stands now the work is smooth and good. Would an old solution like the above be benefited by the addition of a little hydrocyanic acid once in a while?

A.—The silver solution doubtless contains an excess of potassium carbonate which is produced in time from the decomposition of potassium cyanide. Hydrocyanic acid is the only possible remedy. You might add $\frac{1}{2}$ oz. of commercial hydrocyanic acid to each gallon of solution in use. This should be done at the end of the day's work and the bath should be thoroughly stirred. The greatest of care, however, must be exercised in using this acid, inasmuch as it is a most deadly poison. It would also be advisable to use steel hooks to suspend the anodes.

CORRESPONDENCE DEPARTMENT

Correspondence is solicited from all of our readers on subjects relating to the smelting, refining, founding, finishing, rolling, drawing, stamping, spinning, plating and polishing of all of the non-ferrous metals and alloys. Name and address must be given, though not necessarily for publication. Address THE METAL INDUSTRY, 61 Beekman Street, New York.

STOP OFF VARNISH.

To the Editor of THE METAL INDUSTRY:

In the January issue of THE METAL INDUSTRY I notice a reply concerning a stop off varnish. As I have had considerable experience with these compounds I might say a word in regard to them.

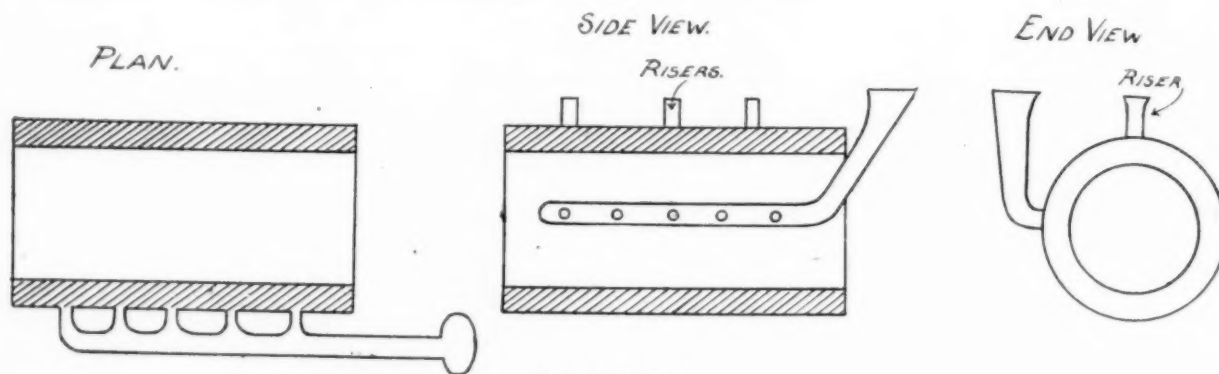
In the manufacture (etching) of name plates and the like I have found it impossible to obtain any compound which would resist the action of potassium cyanide as is used in the silver bath. This silver bath was used cold and would work through the resist within a minute or two, showing the silver plate where it was not wanted. It is thus readily seen that it would not withstand a hot gold or copper solution.

ciently familiar with the subject to know that the word diluted was a misprint and that the sentence should read instead: "the solution should be boiled for half an hour."

BRASS LININGS.

To the Editor of THE METAL INDUSTRY:

We notice that in the issue of THE METAL INDUSTRY of October, 1905, there is illustrated and described a method of casting brass linings. Our practice is somewhat different than the method mentioned in the article referred to, and as we cast linings successfully which weigh 2,000 pounds, our experience might be of interest to your readers.



BRASS LINING.

Some of the resists which I have tried are asphaltum, resin, burgundy pitch, dragon's blood, etc. The best I could recommend would be about one part of resin and burgundy pitch and $\frac{1}{2}$ or 1 part of dry asphaltum. This is molded into sticks and the articles are heated and the wax rubbed or applied to them. The resist is removed with benzine. Lacquer has also been applied, but it has its drawbacks.

I have been doing some experimenting and find that with a little care an imitation Bower-Barff finish can be produced. I coppered the article in the cyanide copper bath and worked it a little hard in a strong current. I then blackened it in the potassium sulphide. With a little experience good results may be obtained. A good lacquer can then be used.

W. VOSS.

FELT WHEELS.

Owing to a printer's error in the January issue of THE METAL INDUSTRY in the communication of Divine Brothers Company the sense of the communication was somewhat obscured. It was stated that "the majority of felt wheels sold to-day at the prevailing prices are compressed and not felted." The sentence should have read: "The majority of felt wheels sold to-day at the prevailing prices are *pressed* and not felted." The communication referred to the "compressed" wheels of the Divine Brothers Company.

A GOLD COLOR SOLUTION FOR PLATING OF STEEL.

In the short article in the January issue of THE METAL INDUSTRY concerning a gold color solution for plating of steel, it is stated that this solution should be diluted for one-half hour. Our readers are suffi-

Our mixture is generally specified and the second one which was mentioned in the article referred to, namely, 88 pounds of copper, 10 pounds of tin and 2 pounds of spelter, is very nearly the usual specification. However, instead of casting the linings on end as described in the article we cast them on the side as is shown in the drawings. With the risers and gates indicated in the sketches we are able to make sound castings of considerable size and make linings at intervals for a number of steamship lines, who send all the way from the coast to Rochester, N. Y., in order to obtain satisfactory castings.

CLUM & ATKINSON.

BOOK REVIEW.

PRACTICAL PATTERN MAKING. By F. W. Barrows. New York, Norman W. Henley Publishing Co. 1906. 326 pages with illustrations; price, \$2.00.

The present volume is written by a practical pattern maker of long experience who treats upon the various subjects connected with pattern making in a clear and forcible style which can be easily understood by the readers for which it is intended. He describes in detail the various materials and tools which are required in pattern making and gives a number of examples for the manufacture of patterns, such as for belt and cable pulleys, steam cylinders, gear wheel patterns, propeller wheels, etc. Some 25 pages are devoted to a discussion of metal patterns. The last part of the book contains remarks upon pattern shop mathematics, comprising calculation of patterns and formulas, followed by instructions concerning the cost, care and inventory of patterns. There is no doubt that the information contained in the book will be of interest and value to pattern makers.

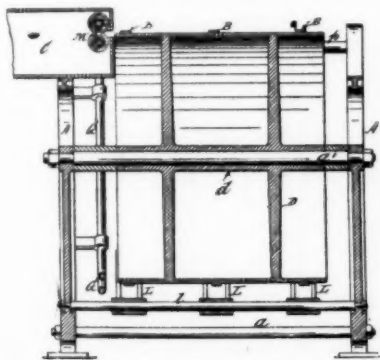
P A T E N T S

A full copy of any Patent mentioned will be furnished for Ten Cents. Address THE METAL INDUSTRY, 61 Beekman Street, New York

809,472. January 9, 1906. COMPOSITION OF MATTER. B. C. Senton, Rutland, Vt. The invention relates to a new alloy made of tin, zinc and aluminum with chloride of sodium. The ingredients are preferably applied in the following proportions: 12 parts of tin, 2 parts of zinc and 1 part of aluminum. One per cent. of chloride of sodium is added to the alloy. The alloy is stated to be of a pure white color capable of receiving a very high polish and of molding, welding and working in many ways.

809,085. January 2, 1906. ELECTROLYTIC APPARATUS. H. S. Blackmore, Mount Vernon, N. Y. The apparatus is intended for the production of lead sodium alloy or mercury sodium amalgam and the recovery of sodium as hydrate of oxide. The apparatus consists of an iron vessel in which the electrolyte is maintained in a molten condition.

810,851. January 23, 1906. APPARATUS FOR REMOVING SUPERFLUOUS METALLIC COATING FROM SHEET METAL. O. S. Fellows and A. E. Hopkins, Middletown, N. Y. The apparatus is intended for the removal of metallic coatings from sheet metal, and particularly the so-called "list" from the selvage edges of sheet metal plates. The operation consists in feeding a plate



of, for instance, tin-covered sheet iron between the feeding belts B and the periphery of the drum D with its selvage edge projecting beyond the edge of the drum on the side upon which the means for melting and removing the list are situated. The tension maintained upon the feed belts B causes them to hold the body of the sheet metal firmly against the periphery of the drum. The means for removing the excess of metal coating consist of a pair of brushes M.

808,798. January 2, 1906. APPARATUS FOR THE AGITATION OF SOLUTIONS USED IN ELECTRODEPOSITION OF METALS. W. C. Wood and B. Oaksford, London, England. The apparatus is constructed for the purpose of furnishing means for keeping the electrolytic solution in the bath in circulation. For this purpose a trough of wood is arranged at or near the bottom of the electrolytic tank. A reciprocating bar or plunger fits into this trough and has a series of holes formed in it. The liquid will pass into the trough during the upward movement of the plunger and will be forced out again through the holes mentioned above, during the downward movement, thus keeping up the circulation.

809,381. January 9, 1906. SOLDERING FLUX. O. J. Lanigan, Chicago, Ill. The flux is made as follows: 11 parts of red oil and 11 parts of resin are placed together in a suitable receptacle and are heated until the resin becomes liquid. The mixture is then stirred lightly. The temperature is maintained at 130 degrees F. Five parts of FFFF ammonia are then mixed with 101 parts of water about 90 degrees F., and the liquid compound of red oil and resin is then stirred into the ammoniated water with which it forms a yellow viscous emulsion.

809,492. January 9, 1906. PROCESS FOR ELECTROLYTIC PRODUCTION OF LUSTROUS METALLIC COATINGS UPON METALS. A. Classen, Aachen, Germany. The process consists in adding to the electrolytic bath in which the articles are to be coated, a certain quantity of glucose, or of a substance, classed among the glucosides, or an extract of plants, roots barks such as licorice extracts. For the production of zinc coatings the electro-

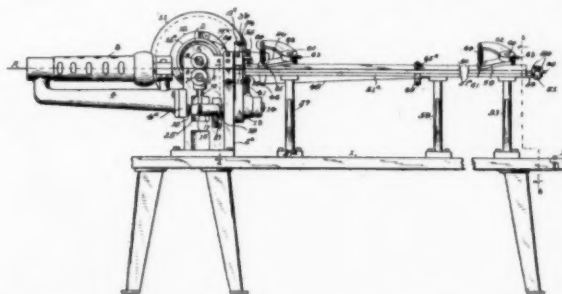
lytic bath is composed of a solution of 20 kilograms crystallized zinc sulphate, 4 kilograms crystallized sodium sulphate, one kilogram zinc chloride and 0.5 kilogram boric acid in 100 liters of water. To this solution is added the extract of 5 kilograms of licorice root. The articles are allowed to remain in the bath until the desired metallic coating is produced.

808,070. December 26th, 1905. Stereotype Plate Casting Apparatus. J. E. Caps, Kansas City, Mo., and G. H. Vining of Vinington, Ark. The invention relates to an apparatus for casting type-high stereotype printing plates from a matrix. The support of a casting box is adjacent to the crucible so that the molten metal can be poured without carrying it to the casting box. The latter is lined with an adjustable non-conducting material and removable strips and adjustable gauges are provided within it.

807,036. December 12th, 1905. Sand Blast Machine. G. W. and W. H. Leiman, New York. The machine consists of a casing, the top of which is slanted and provided with a transparent window for watching the operation of the sand blast upon the article which is treated. The bottom of the bed of the machine slants rearwardly toward the sand receptacle from which the sand is blown. The sand feed pipe leads into the side of the mixing chamber above the lower end of the air jet tube so that the discharge of air from the air jet tube into the sand ejecting nozzle produces a suction which tends to draw the sand from the sand tube. The amount of air pressure admitted to the bottom of the sand box can be controlled by a valve. An agitator is provided which prevents the sand from settling down and forming an obstruction to the flow of the sand-lifting air jet in starting the machine.

807,929. December 19th, 1905. Machine for Cleaning Plates. L. G. Hill, Monessen, Pa. The machine is particularly employed for cleaning and polishing tin plates. In the bottom of the casing of the apparatus there is placed a suitable abrading material, such as sawdust, salt or the like. A number of rolls are provided, some of which serve as guide rolls, while others are intended to polish the sheets as they pass between them. The operating material is lifted by endless conveyors and thrown into contact with both sides of the plate.

809,636. January 9, 1906. WIRE STRAIGHTENING AND CUTTING-OFF MACHINE. F. B. Shuster, New Haven, Conn. The machine comprises a bed 1, a machine head 2, and an ordinary rotary wire straightener head 3. It also comprises a wire feed roll mounted on a driving shaft and a second wire feed roll in close



proximity to the first. It is so arranged that it can be easily assembled and taken apart and that the head carrying the wire straightener and cutter holder can readily be detached from the bed or table and used exclusive of the guide bar. The machine can also be extended or added to, so as to cut lengths of wire beyond the capacity of the ordinary compact machines.

806,133. December 5th, 1905. Cut-Off Attachment for Metal Forming Presses. D. T. Graham, St. Louis, Mo. The object of the invention is to provide a cut-off attachment which can be mounted upon an ordinary forming press and which has a cut-off device in alignment with the forming dies and is adapted to receive the strip of metal after it has been operated upon by the forming dies. The apparatus contains two forming dies opposite each other and spaced apart at their adjoining edges which serve to support the strip of metal after it has left the forming dies of the machine upon which the attachment is mounted. A

P A T E N T S

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plunger is arranged above the space formed by the two dies of the cut-off attachment and is so connected to the forming dies that it is operated after any preferred number of operations of the forming dies.

807,014. December 12th, 1905. Speed Changing Mechanism for Metal Working Machines. L. S. Burbank, Worcester, Mass. The essential feature of the mechanism consists of a floating cone of gears. Preferably this cone is held against longitudinal movement and is arranged to co-act with the axially driven member or the axially movable driven member, or both. These driving and driven members, which take the form of gears intermeshing with the cone gears, are mounted to slide upon shafts and are movable past each other so that the different combinations which may be effected for securing different speeds are determined by the number of gears in the cone. It is stated that this feature of the invention is peculiarly applicable in lathe or screw cutting machines as it makes possible the formation of threads of any desired pitch or lead.

804,902. November 21st, 1905. Sanding and Polishing Machine. E. Tyden, Hastings, Mich. The apparatus relates to the type of sanding and polishing machine in which an endless belt is the sanding and polishing element. The arrangements which are particularly described embrace means of applying the pressure for holding the sanding or polishing belt to the work.

806,179. December 5th, 1905. Molding Machine. W. J. Patchell, St. Louis, Mo. The machine contains a vertically reciprocating ramming head which carries a series of vertically placed tubes or cylindrical openings. In each of these openings is arranged a small ram which has a reciprocating motion. Each ram is preferably square in cross section, with an enlarged lower end and a circular head or piston which is fitted air tight within each cylinder. In the operation of the apparatus the ramming head is carried downward and the rams are caused to press the sand within the flask. The compressed air which actuates the rams serves as a cushion in the upward movement. Pro-

vision is thus made for a variable stroke so that the rams accommodate themselves to the irregularities of the pattern in the flask. Provision is also made to pack the sand harder along the sides of the flask than in the center by working the rams at these places with air under a higher pressure than the others. Means are also provided to vent the finished mold for the escape of gas, to strike off the sand and to roll over the drag preparatory to applying the cope.

802,824. October 24, 1905. Process of Making Curtain Rings. A. L. Parker, Rome, N. Y. The process consists in forming the curtain rings from a sheet metal disk, which is preferably drawn to the shape of a cup. Its bottom is then stamped out and its sides curled or bent into tubular form. The operation is conducted in such a manner that the abutting edges of the metal are brought close together on the inner side of the ring. In this way the seam is not visible when the finished ring is placed on the curtain pole.

798,897. Sept. 5, 1905. MOLDING MACHINE.—S. Griffith, Beloit, Wis. The molding machine consists of a main supporting base provided with a pair of vertical standards which are adjustable from the base. A core box is rotatably mounted in bearings in the standards. A drag is adapted to be used in connection with the core box and a laterally adjustable track is located below the core box and the drag. A laterally extensible truck is also mounted on the truck and a platen is arranged to travel upwards and downwards through the truck, in order to receive the drag with its core and to deposit them on the truck. The core box and the drag are first rammed full of sand, which is then struck off even with the free end of the drag, and the drag board is placed and secured upon it by means of clamps. The positions of the core box and drag are then reversed and compressed air is admitted to a cylinder, which elevates the platen until it is in contact with the drag board. The clamps are then removed and the compressed air shut off, so that the weight of the drag and core causes the platen to descend and to deposit the drag with the core on the truck.

T R A D E N E W S

Trade News of Interest Desired from All our Readers. Address THE METAL INDUSTRY, 61 Beekman St., New York.

The Wheeling Steel and Iron Company, Wheeling, W. Va., have lately made repairs in their galvanizing plant, which is again in commission.

A. S. Henn and Company, manufacturers of metal patterns, punches, dies, etc., New Haven, Conn., have recently moved to new quarters at 859 Grand avenue.

J. H. Gautier & Co., crucible manufacturers of Jersey City, N. J., have rearranged their office, which gives them more light and air and makes it more attractive.

The Standard Chemical and Flux Company, 363 Hudson avenue, Brooklyn, N. Y., is making the standard metal flux for use in the melting furnace to clear molten alloys.

The Zucker & Levett & Loeb Company, manufacturers and dealers of plater's supplies at New York City, report that 1905 was the biggest year they ever had. They were never more busy.

Five per cent. phosphorized copper so prepared that any foundryman by following directions can make phosphor bronze is one of the specialties of the Damascus Bronze Company, Pittsburg, Pa.

With 1906 Bruce and Cook, metal dealers, at 186-190 Water street, New York, have entered upon their ninety-fourth year, and they have announced the fact on a wall calendar bearing a cut of their place of business.

The New Era Manufacturing Company, Kalamazoo, Mich., are in the market with a line of special alloys embracing metallic phosphoro (a phosphor tin), nickelumen, white bronze, aluminized zinc and babbitt metals.

The February number of Dixon's *Graphite* contains much interesting matter, such as "The Location and Use of Friction Clutches," "Saving Time in the Drafting Room," also information in regard to graphite and its uses.

Frank Haggenjos and Chas. Erickson have organized the Eureka Brass Company, 2210 Scott avenue, St. Louis, Mo., and will engage in the manufacture of all kinds of brass castings, babbitt and other anti-friction metals.

The Cellini Manufacturing Company, of New Haven, Conn., was recently incorporated with \$10,000 capital, by H. N. Ray, S. A. York and R. F. Worsell, to make and deal in articles of gold, silver, bronze and other materials.

Pure manganese free from carbon and technically free from iron is handled in this country by the Goldschmidt Thermit Company, of 43 Exchange place, New York. Manganese is being used extensively in the alloying of metals.

The New Era Lustre Company, New Haven, Conn., makers of lacquers, say that they are experiencing an influx of new business which is taxing their capacity. Their new enamel gold brush lacquer has, they report, created quite a sensation.

TRADE NEWS

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The S. Obermayer Company, Cincinnati, O., are publishing the *Obermayer Bulletin*, a monthly reading and advertising pamphlet of thirty-two pages, which contains some very instructive ideas on foundry practice. The *Bulletin* is free to any foundryman in the world.

Under patents of James Macphail the Macphail Molding Machine Company, recently incorporated at Davenport, Iowa, will engage in the manufacture of foundry molding machines of the standard stripper plate construction, and a new automatic rock-over machine.

The Crestline Manufacturing Company, Crestline, O., makers of pumps in brass and iron, have erected a new warehouse and storage building, 40 x 100 feet, also an addition to the machine shop, 40 x 50 feet. The company reports that they are installing considerable new machinery.

A new form of waste for wiping machinery is shortly to be placed on the market by the Sanitary Rag Company, of Kalamazoo, Mich. The new product is made by a secret process from rags, and has met with the approval of the United States Government, so the promoters affirm.

The S. Obermayer Company has recently purchased the foundry supply factory of H. S. Vrooman, of Chicago. The entire factory of this concern, as well as their stock of merchandise, has been moved to the Chicago plant of the S. Obermayer Company, which will fill all orders of this department.

C. W. Leavitt & Co., 15 Cortlandt street, New York, make a specialty of special alloys, particularly magnesium metal over 99 per cent. pure, which is used as a deoxidizer for brass and copper castings, also for new silver and argentine alloys, pure aluminum and aluminum alloys of britannia metal.

In the *Daily Consular and Trade Reports* of January 31, Special Agent Crist presents a very complete report on brass buttons in China. The article deals with the present status of the button trade, its possibilities for the American manufacturers, the necessity of samples, methods of packing and marking, etc.

Congdon and Stein, of Ft. Wayne, Ind., entered the plating and polishing field shortly after the first of the year, and are located in an entirely new building, which was completed about January 1. The contract for the entire electroplating plant was awarded to the Dow Chemical Manufacturing Company, of Mansfield, O.

The Household Foundry Company, Providence, R. I., has lately acquired the plant of the Household Sewing Machine Company, and under the managership of Jas. E. Dick, of South Boston, will conduct a general foundry business for the production of machinery castings of every description in the ferrous and non-ferrous metals.

The Davis Foundry and Machine Company, Rome, Ga., have lately moved into their new plant, which includes a 50 x 120 foot two-story machine shop, a 50 x 80 foot foundry and a two-story office building with 60-foot front. The company manufactures the Davis double-turbine water-wheel, engines, boilers, brass and iron castings and machinery.

The Murdock Manufacturing and Supply Company, of Cincinnati, O., was recently incorporated by J. G. Murdock, Jr., president; J. D. Murdock, vice-president; K. Murdock, secretary-treasurer; C. H. Jacob and W. T. Boyd. Capital, \$100,000. The new company will take over the American Brass Works and will add a line of wholesale plumbing supplies.

Among the proposals of the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., are the following: Sched-

ule 340, brass unions; schedule 352, mixed acid; schedule 353, spelter, miscellaneous hardware, sheet zinc; schedule 354, brass pipe and fittings. Bids on all of the above are to be opened February 20. Further particulars and blanks may be had from the Bureau.

Mr. Fitch's interest in the Fitch-Morency Brass Company, Sturgis, Mich., has been sold to C. A. Miller and Chas. Erbsmehl, and the business will be continued as the Morency Brass Company, Mr. Morency retaining his interest and continuing as superintendent and manager of the plant. The company is turning out \$1,500 worth of work per week and employs 25 men, which force will shortly be increased.

Owing to the large contracts on hand and the great increase in the sale of their brazing solder, H. M. Shimer & Company, Philadelphia, Pa., have found necessary the erection of a 60x80 foot brick and iron addition to their factory at Nineteenth street and Washington avenue. This increase will double their capacity for Golden Rod spelter and other metals and will soon place them in a position to buy Sal Skimmings in large quantities.

The Sandoval Zinc Company, Chicago, Ill., have increased their works at Sandoval, Ill., for the production of by-products of zinc and lead. They announce that they are manufacturers not only of prime western spelter, but of a pure spelter from their own Arkansas mines which is chemically pure and assays 99.85 per cent. Pure pig lead is also one of their products. The company solicits correspondence with any one who is using this class of material.

Consul John H. Grout, of Malta, reports that American jewelry and plated ware are likely to secure a footing in that island. The firms there are very much pleased with American lines, as shown in catalogues, but they hesitate in buying from lists without having seen actual samples. Mr. Grout offers to show samples to native dealers if any American firms care to send them to him at shipper's risk and expense. Malta imposes no duty on jewelry and silverware.

A new copper compound, the use of which in the production of copper, brass and bronze electro-plating baths was described in the January number of *THE METAL INDUSTRY*, can be obtained from the Finkell-Hachmeister Chemical Company, 1910-12 Forbes avenue, Pittsburgh, Pa. Platers who have tried this copper compound are delighted with the results. The Finkell-Hachmeister Chemical Company are also manufacturing chemists and importers.

Goldberg and Rathman, metal dealers at 289-293 Commercial street, Boston, Mass., were lately the victims of an alleged fraudulent statement circulated among Boston and New York banks that their firm was nearing financial collapse. This fraudulent statement apparently emanated from Bradstreet's, New York, whose name was signed, but later this company proved that the statement was not theirs, and now a reward of \$1,000 is offered for the conviction of the persons who perpetrated the fraud.

The Taunton Crucible Company, Taunton, Mass., informs us that the statement published relating to the revival of the Phoenix Crucible Company under new management was utterly false. The Taunton Crucible Company bought in May, 1902, from the American Smelting & Refining Company their plant at Taunton, Mass., which was sold to them by the Phoenix Company, and in the deed it conveys all the rights to use the word of Phoenix for patents, molds and other useless things which were of no value to the Taunton Crucible Company. It will thus be seen that there was no truth in the published statement that in the sale of the Phoenix Crucible Company to the American Smelting & Refining Company the name and good will of the business was not sold, but only the equipment.

TRADE NEWS

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"A Substitute for Platinum," is the heading of a description of a new metal mentioned in the Baltimore *Sun*. The new metal is produced by Charles H. Birmingham, 231 South Exeter street, Baltimore, Md., and Mr. Birmingham says his metal has the properties of platinum, but will cost much less. As soon as the patents on his product are granted he will be ready to send out samples. At present he is arranging to build a plant for the production of what he calls "American Platinum."

AUTOMOBILE EXHIBITS

The following is a list of the manufacturers at the recent New York Automobile Shows, who exhibited brass, bronze or aluminum parts and accessories: The Badger Brass Manufacturing Company, Kenosha, Wis., lamps; R. E. Dietz Company, New York, lamps; Smith & Mabley, New York, lamps; C. T. Ham Manufacturing Company, Rochester, N. Y., lamps; Gray & Davis, Amesbury, Mass., lamps; Atwood Manufacturing Company, Amesbury, Mass., lamps; Edmunds & Jones Manufacturing Company, Detroit, Mich., lamps; A. H. Funke, New York, lamps and horns; Stevens & Company, New York, lamps and horns; Rose Manufacturing Company, Philadelphia, Pa., generators; English & Mersick Company, New Haven, Conn., lamps and body fittings; Gabriel Horn Manufacturing Company, Cleveland, O., horns; Veeder Manufacturing Company, Hartford, Conn., Odometers; Jos. W. Jones, New York, speedometers; Motor Car Specialty Company, Trenton, N. J., speedistimeters; R. H. Smith Manufacturing Company, Springfield, Mass., speedometers; Acety-vone Company, New York, generators; B. Morgan, Newport, R. I., carburetors; F. H. Wheeler, Indianapolis, Ind., carburetors; Noera Manufacturing Company, Waterbury, Conn., pumps; Wray Pump and Register Company, Rochester, N. Y., pumps; McCord & Company, Chicago, Ill., lubricators; William Cramp & Sons, Philadelphia, Pa., white bronze castings; Auto Brass and Aluminum Company, Flint, Mich., castings and parts; Light Manufacturing and Foundry Company, Pottstown, Pa., castings in aluminum, manganese and bronze; Whitlock Coil Pipe Company, Hartford, Conn., aluminum hoods; Springfield Metal Body Company, Springfield, Mass., aluminum bodies.

ROLLING MILLS

The Atlan Copper and Brass Company, Pittsburg, Pa., which was incorrectly reported by the press as the Atlas Brass and Copper Mill Company, write us that negotiations relative to the erection of a plant at Trafford City, Pa., are as yet incomplete. The company is capitalized at \$750,000.

The daily press reports that the Pittsburgh Reduction Company has bought a parcel of land at Niagara Falls on which the company will build a large mill for rolling sheet aluminum and drawing wire. It is said that the mill will cover 4 acres of ground and that the main building will be 200 x 100 feet. The company already has two reduction works at Niagara, one located along the river at the southern end of the town near the various electrochemical plants and the other in the Northern end near the Falls. Their rolling mill plant is located at Pittsburgh. At the time we go to press no statement of the company about the new mill was obtainable.

The latest reports on the progress of the new rolling mill of the Michigan Brass & Copper Company, to be located at Detroit, Mich., state that the organizers have planned a mill to do \$1,500,000 worth of business a year from the start, occupying a 12½ acre site just east of Fort Wayne line with a 415 ft. front on River street and extending back 1,250 feet to the channel bank employing hundreds of men and in complete operation in six months. The land has already been bought and paid for. At the recent meeting of the stockholders the following directors were chosen: James E. Danaher, Henry B. Ledyard, George H. Barbour, M. J. Murphy, Fred. T. Moran, M. D. Carpenter, Fred. M. Alger, Jeremiah Howe and D. M. Ireland.

The directors then chose the following officers: George H. Barbour, president; F. T. Moran, vice-president; N. F. Carpenter, temporary treasurer; F. T. Moran, temporary secretary.

H. B. Ledyard, Jeremiah Howe and D. M. Ireland were selected as a building committee and instructed to go ahead with the work. Temporary quarters of the company will be in the office of the Carnegie Steel Company, Union Trust Company Building, at Detroit. The capital stock of the company is \$1,000,000, of which \$500,000 has been subscribed. The Michigan Central Railroad runs through the company's property.

NEW CATALOGUES

"Diamond and Carbon Tools for Mechanical Purposes" is the title of a 16-page pamphlet issued by the Estate of John Dickinson, New York.

The J. W. Paxson Company's catalogue No. 14 is a very complete, interesting and instructive exposition of molding machines. It is well executed and should be in the hands of every foundryman.

"Facts About Electro-Plating and Electro-Plating Salts" contains some good points for the plater. The pamphlet is issued by the United States Electro-Chemical Company, 80 Elm street, New York.

Patterson, Gottfried and Hunter, New York, have issued a folder on their Twentieth Century Tool Box, and another on their Waterproof Gem Belt, which "is waterproof and almost every other kind of 'proof'."

An illustrated catalogue of cast novelties and specialties in soft cast metal has been received from the Atlas Metal Manufacturing Company, Irvington, N. J. In addition to these regular lines there is announcement of cast goods suitable for the fancy goods trade.

"All About Babbitt Metals" is a booklet which the New Era Manufacturing Company, Kalamazoo, Mich., has published. It treats of babbitt metals under the following heads: Physical properties, elastic tension, resistance to crushing strain, tensile strength, resistance to heat, anti-friction properties.

The Watson-Stillman Company, 46 Dey street, New York, have just issued an 86-page catalogue, showing a full line of hydraulic jacks. The last few pages are taken up with a description of the contents of their twelve other catalogues. All of the thirteen comprise a very complete line of hydraulic machinery for all purposes.

One of the famous mold makers of the country is J. P. Fanning, of 678 Jefferson avenue, Brooklyn, N. Y. Mr. Fanning has made molds the study and occupation of a lifetime, and numbers among his patrons some of the largest and exacting firms. He has lately issued an illustrated catalogue descriptive of his various ingot, solder and babbitt molds, which makes interesting reading to any one using molds. The catalogue also contains a portrait and sketch of Mr. Fanning.

FIRES

A small fire broke out January 21 at the works of the Bridgeport Deoxidized Bronze and Metal Company, Bridgeport, Conn. The slight loss which ensued was amply covered by insurance, and business was not at all interrupted.

On January 16 the building in which were located the Taunton Aluminum Works, of Taunton, Mass., was burned, and the company suffered a fire and water loss of stock and machinery approximating 90 per cent. At the time of the fire the company reported that they would resume operations in about three weeks with an increase in facilities and working force.

ASSOCIATIONS

The annual meeting and election of officers of the Buffalo Foundrymen's Association took place at its headquarters, Nos. 685-691 Ellicott Square, on January 16, 1906. The following officers were elected for the ensuing year: President, Lyman P. Hubbell; vice-president, Wm. H. Barr; treasurer, Geo. M. Trefts; secretary, John E. Gorss; executive committee, Lyman P. Hubbell, Wm. H. Barr, T. L. Richmond, Edward Kener, Jr., and H. D. Miles. The reports of the treasurer and secretary showed that the association is in a very prosperous condition, with a membership of 36 foundry firms and four applications to be acted upon at the next regular monthly meeting. The attendance at the meetings during the year has averaged 90 per cent., which shows the interest taken in the work and explains why this is the banner organization of this character in the country. Twenty-two of the members are affiliated with the National Founders' Association. The members are especially interested in the employment department feature of the association, many of the firms giving employment only to those who are recommended by the bureau. The committee on topics have already communicated with several able speakers who will no doubt give some very entertaining talks in connection with foundry practice, which will make the meetings even more interesting than they were during the past year.

MEETINGS

The annual report of the Coe Brass Company, Torrington, Conn., gives the officers as follows: President, C. F. Brooker, of Ansonia; vice-president, Jas. A. Doughty; treasurer, E. T. Coe; secretary, E. J. Steele; assistant secretary, Geo. H. Turner. The board of directors consists of the president, vice-president, secretary, treasurer and J. P. Elton, J. S. Elton and A. P. Hine.

At the recent annual meeting of the Norwalk Brass Company, South Norwalk, Conn., the stockholders chose the following directors: E. Hill, Wallace Dann, H. E. Dann, Eben Hill, Jr., H. H. Messman, O. H. Banks and W. A. Curtis. The directors elected as officers: President, Wallace Dann; treasurer, W. A. Curtis; secretary, Frank Comstock.

PERSONALS

The Schaeffer and Budenberg Manufacturing Company, Foxboro, Mass., have engaged J. F. Rider as foreman for their brass foundry.

Edward Taylor, of the Rockford Silver Plate Company, Rockford, Ill., has been spending some time in the New England States on a business trip.

Dr. L. P. T. Heroult, the well-known discoverer of the process for producing aluminum used in Europe, has been in the United States for some weeks in connection with the introduction of his process for manufacturing steel by electricity. A Canadian commission, which was sent over to Europe last year by the Canadian Government, to investigate his process, found it of such value that the Government authorized the carrying out of experiments on a large scale which are now in progress.

DEATHS

As we go to press we learn of the sudden death of Frederick T. Towne, general superintendent of the Yale & Towne Manufacturing Company, Stamford, Conn. Mr. Towne addressed a meeting of employees on Saturday afternoon, February 3, on the occasion of the semi-annual distribution of the \$1,200 offered by the company for suggestions of mutual benefit to employer and employee. He fainted a few minutes after finishing his speech, and, though medical aid was summoned immediately and he was taken at once to his home, Mr. Towne did not regain consciousness and died on Sunday morning, February 4, from Bright's disease. He had but recently returned to his desk after undergoing a serious operation. It was the ambition of Mr. Towne to make the Yale & Towne plant the ideal factory of the world, regarding the relations of master and workman. His untimely death at the age of 33 will be deeply regretted by all who knew him and his work. It was but a few days ago that he corresponded with THE METAL INDUSTRY on a subject of mutual interest.

METAL MARKET REVIEW

NEW YORK, February 5, 1906.

COPPER.—The London market for standard copper has been very active. Spot copper opened at £79 15s., advanced on the 3d to £80 5s. and, after declining to £77 on the 19th, closed at £78 10s., a net decline for the month of £1 5s.

In the New York market the natural dullness at this season of the year in the general manufacturing trade has had its effect on the home copper market, and it is evident that the abnormal premium on spot copper has ceased to exist. We have probably seen the highest prices for copper for the entire coming year, and the general drift of prices will surely trend to a gradually lower basis. Conditions in Europe are not as bullish, consumption has declined and at the same time there will be more copper available, and Europe will not be entirely dependent on America. The demand here is good, brass manufacturers are all full of orders and general trade conditions are in good shape. Some of the largest consumers have contracted for their supplies for the first half of 1906, and most producers are fairly well sold up. The exports for the month of January are 14,856 tons, against 21,245 same month last year. Spot Lake and Electric, 18¾ cents; futures for the next three months, 18¾ cents; casting brands, 18 cents.

TIN.—The London market for pig tin has been very active owing entirely to the speculative interests in that center. Spot tin opened at £161 10s., advanced to £167 15s. on the 15th and closed at £166 5s. Trading in the London market has been very active, and the bull clique is apparently in full control again.

In New York we have had a strong market with a good active consuming demand right along. The arrivals during the month have been large, 4,300 tons, but against that consumption is estimated at 3,900 tons. Spot tin has been more or less scarce and always at a premium of 10 to 15 points over late deliveries. Statistically the position of pig tin is not as strong as a month ago. The shipment from the Straits for January were heavy, 5,970 tons, and the total visible supply to-day is only 1,359 below that of a year ago, while the price in London is £30 higher. The London bulls are banking entirely on the American market. To-day we have a visible supply of 6,021 tons. This will carry us very nearly two months. We shall probably have to buy a little tin in London, but we are not as utterly dependent on that speculative market as we were two months ago, and it will be interesting to watch the bull crowd in London holding up the market with "their own boot straps." Market closes to-day: Spot, 5-10 ton lots, 36.75 cents; February, 36.50 cents; small lots, 10 to 15 points higher.

LEAD.—The foreign lead market has declined in sympathy with all other metals. Opening at £17 10s., the price advanced 2s. 6d. and then steadily declined to £16 5s. at the close.

In the New York market we have had a more or less sagging market, with spot carloads quoted at from 5.75 to 5.85 cents, while the trust price has been kept at 5.60 cents for shipment lead.

SPELTER.—The London market opened strong at £29 5s., advanced 2s. 6d., the highest point, on the 5th, and later dropped suddenly to £28, and closed weak at £27 2s. 6d.

In the New York market prices were steadily pushed up to 6.60-6.65. New York basis, but the demand was not very good. Consumers did not come in, and with the lower foreign cable prices here readily gave way. The operators for the advance were not able to hold their market, and after running prices up from 6 to 6.50 St. Louis, the market broke and closes to-day 5.95 St. Louis and 6.15 New York, carload lots.

SILVER.—The London silver market has gradually worked down to a lower basis, and it is difficult to figure how silver can legitimately be kept up to the high limits lately ruling. Production is increasing rapidly, and the metal as a barter of commerce is being discarded in favor of the "yellow metal," and it is only a matter of time probably when gold will have to give way as a standard to some less common commodity. Silver in London opened at 30 1-16d., and in New York at 64¾ cents, dropped to 29¾d. in London and closed at 30 3-16d., with the New York official price at 65½ cents, showing a slight advance for the month.

OLD METALS.—The old metal market has suffered from the general dullness and waiting policy in vogue at this season of the year, and prices have been cut from ¼ cent to 1 cent per pound. The demand from Europe has fallen off, and the market generally is inclined to go slow owing to the decline in spelter and the easier tone to the copper market. Dealers are paying to-day 15.00 to

TRADE NEWS

Trade News of Interest Desired from All of our Readers. Address THE METAL INDUSTRY, 61 Beekman St., New York.

15½ for heavy crucible copper, against 16 or to 16½ a month ago. Slab zinc dross is selling to-day at 5.35, against 5.60 asked last month.

SHEET BRASS AND COPPER.—The brass and copper mills are all full of orders, and old contracts have been nearly absorbed. Sheet copper was put up to 23 cents on December 4 last, and there has been no change since. The demand is good, and consumers are in some instances calling for deliveries ahead of time.

Sheet brass is not governed by any agreement, but the prices of the leading makers stand as the market. There has been no chance since the advance in price (already referred to in these pages) in December last. Most of the old contracts for sheet are now expiring (February) and considerable new business is being booked at the last advance.

TRADE WANTS.

Advertisements will be inserted under this head at 30 cents per line, 4 lines one dollar, for each insertion. Answers sent in our care will be forwarded.

MACHINERY AND EQUIPMENT.

WANTED—Rolling mill about 12 inches diameter, 18-inch face. Also drawing press for work up to 5 inches high. Address FLORENCE SILVER PLATE COMPANY, 530 North Gay street, Baltimore, Md.

WANTED—Gas kiln, new or second hand, for firing glass and china. State price. Address KILN, care THE METAL INDUSTRY.

WANTED—One second hand crusher for extracting brass from ashes. Address MR. SMITH, care of W. D. Allen Manufacturing Company, 151 Lake street, Chicago, Ill.

FOR SALE.

FOR SALE—\$1,500 buys a half interest in the only aluminum foundry in a city of over 300,000 inhabitants. Exceptional opportunity for a practical man not necessarily experienced with aluminum. Address ALUMINUM, care THE METAL INDUSTRY.

HELP WANTED.

WANTED—FOREMAN to take charge of small brass foundry; man capable of mixing good metal and taking full charge of the foundry. Address Box 485, Rockland, Maine.

WANTED—Thoroughly competent, experienced man to galvanize Merchant pipe at a pipe mill. State experience and salary required. Address GALVANIZER, care THE METAL INDUSTRY.

WANTED—FIRST-CLASS CHANDELIER FOREMAN to take charge of factory and plating works. Permanent position. Western house. Address CHANDELIER, care THE METAL INDUSTRY.

WANTED—Foreman for plating room by large Western company, running about 12,000 gallons of solution of nickel copper electro galvanizing, etc. Must thoroughly understand plating in all its branches, be a hustler and possess good executive ability. For such a person this is an exceptional opportunity. In answering state age, experience, by whom employed and salary expected. Address HUSTLER, care THE METAL INDUSTRY.

WANTED—A practical electro plater for cast metal novelties; must understand ormolu gold and fancy finishes. Address A. B. C., care THE METAL INDUSTRY.

WANTED—A competent man to take charge of packing and shipping department of large mill in State of Connecticut. Also a fancy wire drawer; one capable of making his own tools. Address by letter, WIRE MILL, care THE METAL INDUSTRY.

WANTED for our new shop—First class, experienced monitor hands and brass workers; those accustomed to steam work preferred. Apply at the works of the NATHAN MANUFACTURING COMPANY, 416 East 106th street, New York.

WANTED—SUPERINTENDENT for a new aluminum factory; must be experienced; to be in full charge; given interest if found satisfactory. Address ALUMINUM SUPERINTENDENT, care THE METAL INDUSTRY.

WANTED—Salesman to sell crucibles; give age, experience and salary expected. Address BRASS CRUCIBLE, care THE METAL INDUSTRY.

SITUATIONS WANTED.

FOREMAN PLATER with 20 years' experience, 17 years with one firm, desires position with manufacturing concern. References. Address WM. GRANTMAN, 320 E. Livingston street, Columbus, O.

POSITION WANTED as SUPERINTENDENT of factory manufacturing light hardware in brass or iron; prefer New York City or vicinity. Address N. Y. C., care THE METAL INDUSTRY.

PLATER, capable of taking charge of large plant, desires to communicate with some one in need of the services of a thoroughly competent man. Address CAPABLE, care THE METAL INDUSTRY.

SUPERINTENDENT—Position wanted in factory manufacturing brass goods; executive, mechanical, and inventive ability. Address B. G. S., care THE METAL INDUSTRY.

POSITION WANTED by experienced young man as FOREMAN OF PLATING AND POLISHING DEPARTMENT. Best of references. Address G. B., care THE METAL INDUSTRY.

WANTED—Position as SUPERINTENDENT of hardware factory. Thoroughly understands the manufacture of builders' and other light hardware. Address S. H. F., care THE METAL INDUSTRY.

MISCELLANEOUS WANTS.

THE ADVERTISER seeks to meet a thoroughly practical man with a little capital to engage in the manufacture of Art Metal Goods. Address X. Y. Z., care THE METAL INDUSTRY.

WANTED—A small brass foundry, with or without machine shop, preferably in suburban location near New York. Address FOUNDRY, care THE METAL INDUSTRY.

CASH PAID for old precious metals and minerals in any form. Gas mantle dust, bronze powder, bismuth, platinum, mercury, nickel, etc. Address JOSEF RADNAI, 284 Pearl street, New York City.

INFORMATION BUREAU

Subscribers intending to purchase metals, machinery and supplies and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to THE METAL INDUSTRY. Our Information Bureau is for the purpose of answering questions of all kinds. Send for circular.

Metal Prices, February 7, 1906

METALS.

	Price per lb.
COPPER, FIG, BAR AND INGOT AND OLD COPPER	
Duty Free. Manufactured 2½c. per lb.	
Lake, car load lots.....	18.00
Electrolytic, car load lots.....	17.90
Casting, car load lots.....	17.65
TIN—Duty Free.	
Straits of Malacca, car load lots.....	36.50
LEAD—Duty Pigs, Bars and Old 2½c. per lb.;	
pipe and sheets 2½c. per lb.	
Pig Lead, car load lots.....	5.75
SPELTER—Duty 1½c. per lb.	
Western car load lots.....	6.15
ALUMINUM—Duty Crude, 8c. per lb. Plates,	
sheets, bars and rods 13c. per lb.	
Small lots	38.00
100 lb lots	36.00
Ton lots	35.00
ANTIMONY—Duty ¾c. per lb.	
Cooksons, cask lots	15.00
Hallets, cask lots.....	15.00
Other, cask lots.....	14.50
NICKEL—Duty 6c. per lb.	
Large lots .....	.45 to .50
Small lots .....	.50 to .65
MANGANESE—Duty 20%.....	.80
MAGNESIUM—Duty Free	\$1.50 to \$2.00
BISMUTH—Duty Free	1.50 to 1.60
CADMIUM—Duty Free .....	.95 to 1.00
PHOSPHORUS—Duty 18c. per lb.	
Large lots.....	.42
Small lots .....	.50 to .75
GOLD—Duty Free	\$20.67
SILVER—Duty Free .....	.65½
PLATINUM—Duty Free	24.00
QUICKSILVER—Duty 7c. per lb. Price per Flask..	41.00

OLD METALS.

	Price per lb.
Heavy Cut Copper.....	16.00 17.50
Copper Wire	15.75 17.25
Light Copper	14.25 15.50
Heavy Mach. Comp.....	14.25 15.50
Heavy Brass	11.00 12.00
Light Brass	9.00 10.25
No. 1 Yellow Brass Turnings.....	10.00 10.75
No. 1 Comp. Turnings.....	12.50 13.25
Heavy Lead	5.15 5.40
Zinc Scrap	4.75 5.00
Scrap Aluminum, sheet, pure.....	22.00 25.00
Scrap Aluminum, cast, alloyed.....	12.00 18.00
Old Nickel	15.00 25.00
No. 1 Pewter.....	23.00 25.00

SILICON COPPER—	Price per lb.
500 lb. lots.....	.35
100 lb. lots.....	.36
Small lots .....	.38
PHOSPHOR COPPER .....	.28 to .30

ZINC—Duty, sheet, 2c. per lb.	Price per lb.
600 lb. casks	8.50
Open casks	9.00

PRICES OF SHEET COPPER.

SIZES OF SHEETS.		96oz. & over 75 lb. sheet 30x60 and heavier	64oz. to 96oz. 50 to 75 lb. sheet 30x60	32oz. to 64oz. 25 to 50 lb. sheet 30x60	24oz. to 32oz. 18½ to 25 lb. sheet 30x60	16oz. to 24oz. 12½ to 18½ lb. sheet 30x60	14oz. and 15oz. 11 to 12½ lb. sheet 30x60
		CENTS PER POUND.					
Not longer than 72 ins.	Not longer than 72 ins.	23	23	23	23	23	24
	Longer than 72 ins.	23	23	23	23	23	24
	Longer than 96 ins.	23	23	23	23	23	25
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 ins.	23	23	23	23	23	25
	Longer than 72 ins.	23	23	23	23	23	25
	Longer than 96 ins.	23	23	23	23	24	26
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 ins.	23	23	23	24	25	27
	Longer than 72 ins.	23	23	23	24	26	28
	Longer than 96 ins.	23	23	23	25	27	31
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 ins.	23	23	23	24	26	29
	Longer than 72 ins.	23	23	23	25	27	32
	Longer than 96 ins.	23	23	24	26	29	
Wider than 60 ins. but not wider than 72 ins.	Not longer than 72 ins.	23	23	23	24	26	29
	Longer than 72 ins.	23	23	23	25	27	31
	Longer than 96 ins.	23	23	24	26	29	
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 ins.	23	23	24	26	31	
	Longer than 96 ins.	23	23	25	28	33	
	Longer than 120 ins.	24	24	26	31		
Wider than 108 ins.	Not longer than 96 ins.	24	24	26	29		
	Longer than 96 ins.	25	25	27	30		
	Longer than 120 ins.	26	26	28	32		
Wider than 132 ins.	Not longer than 132 ins.	27	27	29			
	Longer than 132 ins.	28	28	31			

Rolled Round Copper, ½ inch diameter or over, 23 cents per pound. (Cold Drawn, Square and Special Shapes, extra.)
 Circles, Segments and Pattern Sheets three (3) cents per pound advance over prices of Sheet Copper required to cut them from.
 All Cold or Hard Rolled Copper, 14 ounces per square foot and heavier, one (1) cent per pound over the foregoing prices.
 All Cold or Hard Rolled Copper, lighter than 14 ounces per square foot, two (2) cents per pound over the foregoing prices.
 Cold Rolled and Annealed Copper, Sheets and Circles, wider than 17 inches, take the same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.
 All Polished Copper, 20 inches wide and under, one (1) cent per pound advance over the price for Cold Rolled Copper.
 All Polished Copper, over 20 inches wide, two (2) cents per pound advance over the price for Cold Rolled Copper.
 Planished Copper, one (1) cent per pound more than Polished Copper.
 Cold Rolled Copper prepared suitable for polishing, same prices and extras as Polished Copper.
 Tinning Sheets, on one side, 2½c. per square foot.
 For tinning both sides, double the above price.
 For tinning the edge of sheets, one or both sides, price shall be the same as for tinning all of one side of the specified sheet.

Metal Prices, February 7, 1906

Net Cash Prices.

COPPER BOTTOMS, PITS AND FLATS.

14 oz. to square foot, and heavier, per lb.	27c.
12 oz. and up to 14 oz. to square foot, per lb.	28c.
Lighter than 10 oz.	33c.
10 oz. and up to 12 oz.	30c.
Circle less than 8 in. diam., 2c. per lb. additional.	
Circles over 13 in. diam. are not classed as Copper Bottoms.	
Polished Copper Bottoms and Flats, 1c. per lb. extra.	

PRICE LIST FOR ROLL AND SHEET BRASS.

Prices are for 100 lbs. or more of Sheet Metal in one order.

Brown & Sharpe's Gauge the Standard.

Common High Brass	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
Wider than and including	2	12	14	16	18	20	22	24	26	28
To No. 20 inclusive.	.22	.23	.25	.27	.29	.31	.33	.36	.39	.42
Nos. 21, 22, 23 and 24.	.22	.24	.26	.28	.30	.32	.34	.37	.40	.43
Nos. 25 and 26.	.23	.24½	.27	.29	.31	.33	.35	.38	.41	.44
Nos. 27 and 28.	.23	.25	.28	.30	.32	.34	.36	.39	.42	.45

Add ½ cent per lb. additional for each number thinner than Nos. 28 to 38, inclusive.

Add 7 cents per lb. for sheets cut to particular lengths, not sawed, of proportionate width.

Add for polishing on one side, 40 cents per square foot; on both sides, double this price.

Brazing, Spinning and Spring Brass, 1 cent more than Common High Brass.

Extra Quality Brazing, Spinning and Spring Brass, 2 cents more than Common High Brass.

Low Brass, 4 cents per lb. more than Common High Brass.

Gilding, Rich Gold Medal and Bronze, 7 cents per lb. more than Common High Brass.

Discount from list 17½ per cent.

PRICE LIST FOR BRASS AND COPPER WIRE.

BROWN & SHARPE'S GAUGE THE STANDARD.	Com. High Brass.	Low Brass.	Gilding Bronze and Copper.
All Nos. to No. 10, Inc.	\$0.23	\$0.27	\$0.28
Above No. 10 to No. 18.	.23½	.27½	.28½
Nos. 17 and 18.	.24	.28	.32
" 19 and 20.	.25	.29	.33
No. 21.	.26	.30	.34
" 22.	.27	.31	.35
" 23.	.28	.32	.36
" 24.	.30	.34	.38

Discount, Brass Wire, 15 and 2½ per cent.; Copper Wire, 15 and 2½ per cent.

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ in. to 3½ in. O. D. Nos. 4 to 13 Stubs Gauge, 22c. per lb. Seamless Copper Tubing, 25c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron Pipe size.	¾	1	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	30	29	24	23	22	22	22	22	22	23	24

BRAZED BRASS TUBING.

Brown & Sharpe's Gauge the Standard.

Plain Round Tube,	¾ in. up to	2 in., to No. 19, Inc.	Per lb.
" " " " " "	¾	19	\$0.35
" " " " " "	1	19	.36
" " " " " "	1½	19	.38
" " " " " "	2	19	.41
" " " " " "	2½	19	.48
" " " " " "	3	19	.65
" " " " " "	3½	19	1.00
" " " " " "	4	19	1.50
Smaller than ¾ inch.			Special
2 inch to 3 inch, to No. 19, inclusive.			.38
3 inch			.40
Over 3 inch to 3½ inch.			.45
Over 3½ inch.			.50

Bronze and copper advance 3 cents. Discount 25 and 5 per cent.

PRICE LIST FOR SHEET ALUMINUM—B. & S. Gauge.

Wider than and including	12 in.	14 in.	16 in.	18 in.	20 in.	24 in.	30 in.	36 in.	40 in.	to Length, one Side.
No. 13 and heavier.	44	44	46	46	46	46	49	49	49	1
" 14.	44	44	46	46	46	46	49	49	49	2
" 15.	44	44	46	46	46	46	49	49	49	1
" 16.	44	44	46	46	46	46	49	49	49	1
" 17.	44	44	46	46	46	46	49	49	49	1
" 18.	44	44	46	46	46	46	49	49	49	1
" 19.	44	44	46	46	46	46	49	49	49	1
" 20.	44	44	46	46	46	46	49	49	49	1
" 21.	44	44	46	46	46	46	49	49	49	1
" 22.	44	44	46	46	46	46	49	49	49	1
" 23.	44	44	46	46	46	46	49	49	49	1
" 24.	44	44	46	46	46	46	49	49	49	1
" 25.	46	49	51	53	53	53	56	56	56	2
" 26.	46	49	52	56	56	56	61	61	61	2
" 27.	46	50	54	58	58	58	64	64	64	2
" 28.	46	50	56	58	58	58	66	66	66	2
" 29.	48	51	58	60	62	62	71	71	71	2
" 30.	48	52	60	62	66	66	72	72	72	2
" 31.	50	54	62	65	70	70	81	81	81	3
" 32.	52	56	64	68	76	76	84	84	84	3
" 33.	54	58	67	72	80	80	91	91	91	3
" 34.	57	62	69	77	85	85	98	98	98	3
" 35.	72	77	87	97	107	107	122	122	122	3
" 36.	87	97	107	122	127	127	142	142	142	3
" 37.	102	112	127	142	157	157	172	172	172	3
" 38.	122	137	152	167	182	182	202	202	202	3
" 39.	142	162	182	202	222	222	242	242	242	3
" 40.	172	202	222	242	262	262	282	282	282	3

*Polished or scratch brushed 2 sides, double above prices.

In flat rolled sheets the above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are for 50 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

Discounts as Follows are Given for Sheet Orders Over 200 Pounds.

200 to 1,000 pounds.	10 per cent. off list.
1,000 to 2,000 "	10 per cent. and 2 "
2,000 to 4,000 "	10 " " 3 "
4,000 pounds and over	10 " " 5 "

PRICE LIST OF SEAMLESS ALUMINUM TUBING—STUBS' GAUGE.

Stubs' G.	¾"	1"	1½"	2"	2½"	3"	3½"	4"	4½"	5"	6"
4 to 11.	..	..	96	86	83	77	67	61	61	61	61
12.	1.08	1.08	96	86	83	77	67	61	61	61	61
13.	1.08	1.08	96	86	83	77	67	64	64	64	64
14.	1.08	1.08	96	86	83	77	67	64	64	64	64
15.	1.12	1.12	96	86	80	70	67	67	67	67	67
16.	1.15	1.15	99	89	83	70	67	67	67	67	67
17.	1.18	1.18	1.02	96	93	86	73	73	73	73	73
18.	1.85	1.24	1.05	99	93	86	77	77	77	77	77
19.	1.88	1.28	1.08	1.02	99	93	83	80	80	80	80
20.	1.95	1.31	1.15	1.08	1.05	99	89	86	86	86	86
21.	2.01	1.37	1.21	1.15	1.12	1.05	99	93	93	93	93
22.	2.17	1.44	1.24	1.18	1.15	1.08	1.05	99	1.05	1.05	1.05
23.	2.33	1.50	1.31	1.24	1.21	1.15	1.15	1.08	1.15	1.15	1.15
24.	2.48	1.60	1.37	1.31	1.28	1.18	1.21	1.21	1.24	1.24	1.24
25.	2.65	1.69	1.47	1.37	1.34	1.28	1.34	..	..	..	..

Prices are for lots of 50 lbs. Boxing extra. Smaller, larger and intermediate sizes furnished by manufacturers.

Discounts as Follows are Given for Tube Orders Over 50 Pounds.

50 to 200 lbs.	5 per cent. discount off list.
200 to 2,000 lbs.	10 " " "
2,000 to 4,000 lbs.	10 and 3 " " "
4,000 lbs. and over.	10 and 5 " " "

PRICE LIST FOR ALUMINUM ROD AND WIRE—B. & S. GAUGE.

Diameter	0000 to No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
B. & S. G'ge.	No. 10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.

Price, per lb.... 40 40½ 40½ 41 41½ 42 42½ 43 44 45 46 49 54

200 lbs. to 30,000 lbs., 3 cents off list; 30,000 lbs. and over, 4 cents off list.

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12.	\$0.62	16.	.58
13.	.53	17.	.59
14.	.54	18.	.60
15.	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive, American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50 per cent.